11.0 SITE 10B - BUILDING 530, MISSILE REWORK OPERATIONS

11.1 SITE DESCRIPTION AND BACKGROUND

Site 10 (Building 530) is located to the west and south of the South Gate of NAS Alameda (Figure 1-2). Site 10 has been used for missile rework operations by the station since 1972 (Canonie, 1990c). No information was available regarding previous site usage of the area; however, Building 530 partially overlaps the site of the pre-existing oil refinery (Site 13).

11.2 PREVIOUS INVESTIGATIONS

No previous site investigations have been performed at Building 530 (Canonie, 1990c).

11.3 CURRENT USE

The missile rework operations performed in Building 530 include electrical maintenance, cleaning, grinding, welding, painting, and paint stripping as well as parts fabrication. According to Canonie, the waste streams generated by these processes are tightly controlled, with all wastes and paint stripping bath liquids being disposed of in 55-gallon drums to an off-site facility (Canonie, 1990c).

11.4 REMEDIAL INVESTIGATION

The remedial investigation conducted by Canonie at Building 530 was intended to evaluate the conditions of VOCs, SVOCs, metals, or TPH if these compounds exist in the soil and groundwater in the vicinity of the building. Three borings were drilled, sampled, and converted to groundwater monitoring wells for the investigation. The borings were purposely placed at the juncture of sanitary sewer and storm sewer lines because these junctions "would be more likely to leak, and because wastes might be more prone to pool at elbow and T-joints where soil has been excavated to deeper depths" (Canonie, 1990c). The locations of the three monitoring wells are shown on Figure 11-1. The monitoring wells were installed to depths of 15 feet bgs and groundwater samples were collected. Table 11-1 presents a list of analyses performed on soil and groundwater samples from Site 10B. Complete boring logs and construction diagrams are included in Appendix C.

11.4.1 Geology/Hydrogeology

In the vicinity of Building 530, the artificial fill ranges from 12 to 13 feet in thickness and consists of light to dark brown, silty fine sand with traces of gravel and brick fragments. In all of the borings, the Merritt Sand directly underlies the artificial fill. It consists of light yellow-brown, clayey, fine sand. Figure 11-2 presents a cross section across the site showing the lateral and vertical distribution of lithologic units based on the Canonie boring logs. Geotechnical laboratory tests were performed on a soil sample from MW530-2; results of these tests are presented in Table 11-2 and in Appendix D.

Groundwater was encountered during drilling at depths of 4.5, 6.0 and 6.5 feet bgs in borings MW530-3, MW530-2 and MW530-1, respectively. Subsequent water level measurements taken by Canonie on November 8, 1990 recorded water level depths of 5.34, 6.74 and 6.64 feet bgs in the three respective wells. The groundwater gradient map generated from the November 1990 data is plotted in Figure 2-4. The local groundwater gradient at that time was about 0.003 foot/foot to the southwest between wells MW530-1 and MW530-2. The gradient between MW530-2 and MW530-3 was slightly steeper at 0.001 foot/foot in the same direction. No other groundwater level data information is available regarding tidal influences at the site.

11.4.2 Analytical Results - Soil Samples

Soil samples were collected for chemical analyses during the drilling of three monitoring wells at Site 10B. At each boring, samples were collected at 1- to 1.5-foot intervals for a total of 37 soil samples. Twenty-one surface and subsurface soil samples were selectively analyzed for VOCs, SVOCs, TRPH, metals, and general chemical characteristics. Additionally, 16 subsurface samples were analyzed for TRPH and 15 subsurface samples were analyzed for VOCs. Table 11-1 provides a summary of analyses by sample. The analytical results are summarized in Tables 11-3 through 11-6 and are shown on Figure 11-3; only the analytes that were detected are presented.

11.4.2.1 Volatile Organic Compounds. Analytical results for VOCs detected in Site 10B soils are summarized in Table 11-3 and are shown on Figure 11-3. VOCs were identified in all of 15 samples analyzed for VOCs. Detected VOCs include methylene chloride, acetone, toluene, ethylbenzene, and xylenes. The soil sample collected at 11.5 feet bgs form boring MW530-1 contained the highest VOC concentrations compared to the other site detections. Methylene chloride was detected in 11 samples, acetone was detected in four samples, and toluene also was detected in 11 samples. Ethylbenzene and total xylenes were reported only in soil samples from MW530-1. Toluene was detected in 11 samples. The highest toluene concentration was detected in the 2-

foot sample from MW530-3 (> 1,000 μg/kg). Only the soil samples collected at the 11.5-foot depth from MW530-1 and the 2-foot depth from MW530-3 contained total VOC concentrations above 1 mg/kg.

11.4.2.2 Semivolatile Organic Compounds. The analytical results for SVOCs in soils at Site 10B are summarized in Table 11-3 and Figure 11-3. SVOCs were detected in 15 of 21 soil samples from Site 10B. The SVOCs detected include the two PAH compounds, 2-methylnaphthalene and pyrene, which were each detected in one sample. 2-Methylnaphthalene was reportedly detected in the 12- to 12.5-foot sample from MW530-1, which is located adjacent to the northeast corner of Building 530. Pyrene was detected in the 11.5- to 12-foot sample from MW530-2. Di-n-butylphthalate was detected in 14 of the 15 samples with the maximum value present in the 14.0- to 14.5-foot sample in MW530-1. Only two soil samples, both collected from the saturated zone from MW530-1, contained total SVOC concentrations above 10 mg/kg.

11.4.2.3 Total Recoverable Petroleum Hydrocarbons. Table 11-4 and Figure 11-3 show the analytical results for TRPH in soil samples from Site 10B. TRPH were detected in a total of 10 out of 16 soil samples. The highest TRPH concentration was found in the soil sample collected at 11.5 feet bgs from boring MW530-1. As noted previously, MW530-1 is located adjacent to the northeast corner of Building 530. Only four soil samples, all collected from MW530-1, contained TRPH concentrations above 100 mg/kg. Two of these soil samples were collected below groundwater.

11.4.2.4 Metals. Analytical results for metals in Site 10B soils are summarized in Table 11-5. Background ranges of metals in soil have been estimated for NAS Alameda based on a study conducted by the PRC team under CTO 121 Mod. 0001. Results of this study are included in the background data summary report (PRC/JMM, 1992c). The estimated background ranges of metals in soil are given in Table 3-1. Based on these background data, nine metals were detected above the 95 percent/95 percent statistical tolerance interval of background concentrations at NAS Alameda. The nine metals are arsenic, barium, cadmium, calcium, cobalt, copper, nickel, potassium, and sodium.

The metal content of 21 samples from various depths were analyzed at Site 10B. Typical concentration ranges of metals occurring naturally in soil are given in Table 3-2. Based on these ranges, only magnesium in one sample exceeded the typical range found in soil. The highest concentration of magnesium, only slightly higher than the typical upper limit, was detected in the 10.5- to 11-foot sample from MW530-3. No extreme upper limit is given for magnesium.

11.4.2.5 General Chemical Characteristics. The analytical results for soil pH are summarized on Table 11-6. One sample was analyzed from approximately the same depth (2.5 or 3 feet) in each of the three monitoring well borings. The soil pH was similar in all samples, ranging from 9.1 to 9.2 pH units.

11.4.3 Analytical Results - Groundwater Samples

All three borings were converted to groundwater monitoring wells, and groundwater samples were collected and submitted for analysis for VOCs, SVOCs, TRPH, oil and grease, metals, and general chemical characteristics. Additionally, four travel blank samples were analyzed for VOCs. Table 11-1 provides a summary of analyses by sample. Table 11-7 through 11-10 and Figures 11-4 through 11-6 summarize the analytical results for groundwater at Site 10B. The travel blank samples are identified on the tables by a 200-series number. The figures and tables present only analytes that were detected.

11.4.3.1 Volatile Organic Compounds. Analytical results for VOCs in groundwater are summarized in Table 11-7 and are shown on Figure 11-4. Methylene chloride was the only VOC detected in MW530-2 and MW530-3. Methylene chloride was also the only VOC detected in four travel blanks submitted at the same time. Methylene chloride and the BTEX compounds benzene, toluene, ethylbenzene, and xylenes were detected in the groundwater from MW530-1.

11.4.3.2 Semivolatile Organic Compounds. The analytical results for SVOCs detected in groundwater at Site 10B are summarized in Table 11-8 and are shown on Figure 11-4. The SVOCs 2-methylnaphthalene and naphthalene, which are also PAH compounds, were detected only in MW530-1. SVOCs were not detected in wells MW530-2 or MW530-3.

11.4.3.3 Petroleum Hydrocarbons. The analytical results for petroleum hydrocarbon compounds in groundwater at Site 10B are summarized in Table 11-8 and are shown on Figure 11-4. One sample from each of the monitoring wells was analyzed for oil and grease content and TRPH. Oil and grease were detected only in MW530-1; TRPH was detected in MW530-1 and MW530-3. No TRPH or oil and grease was detected in well MW530-2.

11.4.3.4 Metals. Analytical results for metals detected in the groundwater at Site 10B are presented in Table 11-9 and are shown on Figure 11-5. A groundwater sample from each of three monitoring wells were analyzed for metals. According to the Canonie QAPP and QA/QC Plan, groundwater samples for metals were field-filtered as appropriate with a 0.45-micron filter (Canonie, 1990b). Background ranges of metals in groundwater have been estimated for NAS Alameda based on a study conducted by the PRC team as CTO 121

Mod. 0001. Results of this study are included in the background data summary report (PRC/JMM, 1992c). The estimated background ranges of metals in groundwater are given in Table 3-3. Based on these background data, manganese and potassium, which had concentrations at Site 10B that exceeded the typical levels, were within the background concentrations estimated for NAS Alameda. Barium, which was above typical levels in two of three samples, was within background levels (95 percent/95 percent statistical tolerance intervals) for one of those samples and only slightly above for the other.

Typical concentration ranges of metals occurring naturally in groundwater are given in Table 3-4. Based on these ranges, groundwater samples from at least one of the three wells exceeded the typical ranges for aluminum, arsenic, barium, cadmium, chromium, cobalt, copper, iron, manganese, nickel, potassium, selenium, silver, titanium, and vanadium. For those elements with extreme limits provided, only vanadium was exceeded in all three wells, and arsenic, iron, manganese, and potassium were well within their extreme limits. For cadmium, selenium, and silver the detection limit was higher for some samples than the typical limit of those metals occurring naturally in groundwater.

11.4.3.5 General Chemical Characteristics. General chemical analyses selectively performed on the groundwater samples form Site 10B include specific conductivity, TDS, dissolved oxygen, pH, TOC, alkalinity (bicarbonate, carbonate, and total [all as $CaCO_3$]), chloride, sulfate, and total hardness (as $CaCO_3$). Results of the general chemical analyses are presented in Table 11-10 and are shown on Figure 11-6.

11.5 SUMMARY AND CONCLUSIONS

The purpose of the data summary report is to provide a qualitative assessment of the Canonie data to identify whether sufficient information is collected for the RI/FS evaluation. As discussed in Section 3, QA/QC information is not available for the data validation; therefore, the data presented in this report have been validated under EPA CLP procedures.

11.5.1 Soils

A total of 37 surface and subsurface samples were collected by Canonie during the drilling of three monitoring wells at Site 10B. Boring logs indicate that artificial fill underlies the site and the Holocene Bay Mud Unit underlies the fill. Merritt Sand deposits were encountered under the Bay Mud Unit in MW530-1. Samples collected from the three soil borings were analyzed for VOCs, SVOCs, TRPH, metals, and pH.

VOCs were detected in soil samples collected from both the fill and the Bay Mud Unit. Methylene chloride and acetone, two common laboratory contaminants, were detected in all three borings. Other VOCs detected are ethylene, ethylbenzene, toluene, and xylenes. Detected concentrations found in the soil samples generally decrease at depth and the highest concentrations were detected in the soil sample collected at 11.5 feet bgs from MW530-1, the northernmost boring. Total VOCs in the 11.5-foot sample from MW530-1 and the 2-foot sample from MW530-3 exceed the preliminary comparison level of 1 mg/kg for total VOCs. Concentrations of VOCs in MW530-2 were well below the preliminary comparison level.

SVOCs, consisting of phthalates and PAH, were detected at low concentrations in the two southern borings. Concentrations in MW530-1, located on the north side of building 530, were high (>10 mg/kg) compared to the other borings and increase with depth. Concentrations, although not as high as in MW530-1, generally increase with depth in the other two borings as well. The concentrations of total SVOCs in two samples from MW530-1 (the 12-foot and the 14-foot samples) exceed the preliminary comparison level of 10 mg/kg for total SVOCs.

TRPH was detected in all three borings. Detections occurred in both the artificial fill and the Bay Mud Unit. The northernmost boring, MW530-1, has elevated concentrations compared to the other borings. Concentrations of TRPH decrease at depth in all borings. Four samples from MW530-1 exceeded the preliminary comparison level of 100 mg/kg for TRPH in soil.

Nine metals are present in the soil samples at concentrations exceeding the 95 percent/95 percent statistical tolerance interval of background concentrations at NAS Alameda (PRC/JMM, 1992c). However, all metals analyzed were within the range of concentrations typically found in soils with the exception of magnesium, which was still within background levels.

If the analytical results can be validated and are considered to be acceptable, the following conclusions can be made:

- Elevated levels of VOCs were found in soil samples collected from monitoring wells MW530-1 and MW530-3, and elevated levels of SVOCs were found in soil samples collected from well MW530-1. Additional soil investigation is required to further characterize the VOCs and SVOCs found at these locations.
- Elevated levels of TRPH were found in soil samples from well MW530-1; additional soil investigation is required to characterize the petroleum hydrocarbons in the soil near well MW530-1.
- Sufficient soil metals data have been collected for the RI/FS evaluation.

The significance of the presence of these VOCs, SVOCs, TRPH, and metals in soil will be further evaluated during the risk assessment to be performed during the comprehensive RI/FS work.

11.5.2 Groundwater

Three monitoring wells were installed by Canonie at Site 10B. Based on water level measurements taken in November 1990, groundwater flow is generally to the west at a gradient of about 0.001 foot/foot. Groundwater samples were taken from each well and analyzed for VOCs, SVOCs, petroleum hydrocarbons, metals, and pH. VOCs, SVOCs, TRPH, and oil and grease were detected at Site 10B.

VOCs and SVOCs were detected in groundwater samples at Site 10B. Low concentrations of methylene chloride were detected in all of the monitoring wells. In addition to methylene chloride, BTEX was detected at potentially elevated concentrations in MW530-1, located to the northeast of Building 530. Two SVOCs (PAH compounds) were also detected in MW530-1. No other SVOCS were detected in groundwater samples collected from the other two wells. TRPH were detected in MW530-3, located southwest of building 530, and in MW530-1, in which oil and grease was also detected. The concentration of TRPH in MW530-1 is two orders of magnitude higher than that detected in MW530-3. No other petroleum hydrocarbons were detected at Site 10B.

Fourteen metals are present in the groundwater at concentrations exceeding the 95 percent/95 percent statistical tolerance limit of background concentrations at NAS Alameda (PRC/JMM, 1992c). However, of these metals, arsenic and iron were reported at concentrations that do not exceed the extreme upper concentration that can be found in typical groundwater samples. The concentration of vanadium, however, at Site 10B does exceed its extreme upper limit (Table 3-4). The concentrations of zinc in the groundwater samples exceed the background limit but do not exceed the typical concentration limit. The remaining metals with concentrations above background levels do not have an extreme native upper limit.

If the analytical results can be validated and are considered to be acceptable, the following conclusions can be made:

- Groundwater in the local vicinity of monitoring well MW530-1 may have been impacted by VOCs, SVOCs, and petroleum hydrocarbons. MW530-1 is the farthest monitoring well upgradient at the site. Additional groundwater well(s) are necessary near well MW530-1 to further characterize the VOCs, SVOCs, and petroleum hydrocarbons in the groundwater.
- Metals are present in the groundwater at concentrations exceeding the 95 percent/95 percent statistical tolerance interval for NAS Alameda. Additional data are required to characterize the groundwater quality at this site.

- Additional TDS data are required to evaluate whether groundwater beneath the site is considered as potential drinking water.

- At present, no information is available to evaluate the tidal influence on groundwater and the deeper groundwater-bearing zone. Additional work is required to evaluate the tidal influence on the deeper groundwater-bearing zone.

The significance of the presence of these VOCs, SVOCs, and metals in groundwater will be further evaluated during the risk assessment to be performed during the comprehensive RI/FS work.

TABLE 11-1

SITE 10B - BUILDING 530, MISSILE REWORK OPERATIONS
SUMMARY OF LABORATORY ANALYSES PERFORMED ON SOIL AND GROUNDWATER SAMPLES
(Sheet 1 of 2)

Boring	Depth	Matrix	Alkalinity/Acidity	Ammonia	Ammonium	Asbestos (Tot)	Ash (Tot)	SVOC	BTU Value	Cations/Anions	CEC	Cyanide (Tot)	DO (Tot)	EDB	Herb Uniq	Herbicides	Mercury	Metals	Pest/PCB	pH	Phosphorous	Potassium	Radiation	Spec. Con.	Kjeldahl Nitrogen	TOC	TRPH	TRPH/Oil&Grease	TS/TDS	VOC
MW530-1	1.0-1.5	Soil					•										•													
MW530-1	2.5-3.0	Soil																								•			•	
MW530-1	3.0-3.5	Soil					•										•		•											
MW530-1	5.5-6.0	Soil																								•				
MW530-1	6.0-6.5	Soil																								•			•	
MW530-1	6.5-7.0	Soil					•										•													
MW530-1	7.5-8.0	Soil					•										•													
MW530-1	8.5-9.0	Soil																								•			•	
MW530-1	9.0-9.5	Soil					•										•													
MW530-1	11.5-12.0	Soil																								•			•	
MW530-1	12.0-12.5	Soil					•										•													
MW530-1	13.5-14.0	Soil																								•			•	
MW530-1	14.0-14.5	Soil					•										•													
MW530-2	0.5-1.0	Soil					•										•													
MW530-2	2.0-2.5	Soil																								•			•	
MW530-2	2.5-3.0	Soil					•										•		•											
MW530-2	5.0-5.5	Soil																								•			•	
MW530-2	5.5-6.0	Soil					•										•													
MW530-2	8.0-8.5	Soil																								•			•	
MW530-2	8.5-9.0	Soil					•										•													
MW530-2	11.0-11.5	Soil																								•			•	
MW530-2	11.5-12.0	Soil					•										•													
MW530-2	14.0-14.5	Soil																								•			•	
MW530-2	14.5-15.0	Soil					•										•													
MW530-2R	6.0-6.5	Soil					•										•													
MW530-3	0.5-1.0	Soil					•										•													
MW530-3	2.0-2.5	Soil																								•			•	
MW530-3	2.5-3.0	Soil					•										•		•											
MW530-3	4.0-4.5	Soil																								•			•	

TABLE 11-1

SITE 10B - BUILDING 530, MISSILE REWORK OPERATIONS
SUMMARY OF LABORATORY ANALYSES PERFORMED ON SOIL AND GROUNDWATER SAMPLES
(Sheet 2 of 2)

Boring	Depth	Matrix	Alkalinity/Acidity	Ammonia	Ammonium	Asbestos (Tot)	Ash (Tot)	SVOC	BTU Value	Cations/Anions	CEC	Cyanide (Tot)	DO (Tot)	EDB	Herb Uniq	Herbicides	Mercury	Metals	Pest/PCB	pH	Phosphorous	Polassium	Radiation	Spec. Con.	Kjeldahl Nitrogen	TOC	TRPH	TRPH/Oil&Grease	TS/TDS	VOC
MW530-3	5.0-5.5	Soil					•										•													
MW530-3	7.0-7.5	Soil																								•				•
MW530-3	8.0-8.5	Soil					•										•													
MW530-3	10.0-10.5	Soil																								•				•
MW530-3	10.5-11.0	Soil					•										•													
MW530-3	11.5-12.0	Soil																								•				•
MW530-3	12.5-13.0	Soil					•										•													
MW530-3R	8.5-9.0	Soil					•										•													
Summary		**Soil**					21										21		3							16				15
214	0.0	Water																												•
215	0.0	Water																												•
217	0.0	Water																												•
218	0.0	Water																												•
MW530-1	0.0	Water	•				•		•			•					•		•					•		•		•	•	•
MW530-2	0.0	Water	•				•		•			•					•		•					•		•		•	•	•
MW530-3	0.0	Water					•		•			•					•		•					•		•		•	•	•
Summary		**Water**	2				3		3			3					3		3					3		3		3	3	7

Notes:

200-series boring numbers indicate travel blanks

Analysis	Methods	Matrix
DO	DO	water
Spec Con	EPA 120.1	water
Misc.		
TDS	EPA 160.1	water
Sulfate	EPA 300.0	water
Chloride	EPA 300.0 (Mod)	water
Alk Total	EPA 310.1	water

Analysis	Methods	Matrix
Misc. (cont)		
Alk Bicarb	EPA SM403	water
Foaming Agents	EPA 425.1	water
Hardness	SM 314A	water
Oil & Grease	EPA 413.1	water
TOC	EPA 415.2	water
TOC	EPA/CE 81-1	water

Analysis	Methods	Matrix
TRPH	EPA 418.1	water
Metals	EPA 200.7	water
Metals	EPA 6010	soil
SVOC	EPA 624	water
SVOC	EPA 8270	water
VOC	EPA 624	water
VOC	EPA 8240	soil
pH	EPA 9045	soil

TABLE 11-2

SITE 10B - BUILDING 530, MISSILE REWORK OPERATIONS
GEOTECHNICAL SAMPLE LABORATORY TEST RESULTS

Sample No.	Depth (ft)	Soil Classification Laboratory	Soil Classification Field	Moisture Content (%)	Dry Density (pcf)	Specific Gravity	Hydraulic Conductivity (cm/s)
MW530-2	7	SP	SM	12.9	109.7	NA	NA

Notes:
NA - Not Analyzed
Parameters not detectect are reported as less than method detection limit.

Laboratory Methods (Units):
Soil Classification - Unified Soil Classification System (USCS) - ASTM D2488
Moisture Content - ASTM D2216 (percent)
Dry Density - ASTM D2937 (pounds per cubic foot)
Specific Gravity - ASTM D854
Hydraulic Conductivity - EPA 9100 (centimeters per second)

Soil Classification Legend:

GW	Well graded gravels, gravel-sand mixtures, little or no fines
GP	Poorly graded gravels, gravel-sand mixtures, little or no fines
GM	Silty gravels, gravel-sand-silt mixtures
GC	Clayey gravels, gravel-sand-clay mixtures
SW	Well graded sands, gravelly sands, little or no fines
SP	Poorly-graded sands, gravelly sands, little or no fines
SM	Silty sands, sand-silt mixtures
SC	Clayey sands, sand-clay mixtures
ML	Inorganic silts and very fine sands, rock flou silty or clayey fine sands or clayey silts with slight plasticity
CL	Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, silty clays, lean clays
OL	Organic silts and organic silty clays or low plasticity
CH	Inorganic clays of high plasticity, fat clays

TABLE 11-3

SITE 10B - BUILDING 530, MISSILE REWORK OPERATIONS
RESULTS FOR VOLATILE AND SEMIVOLATILE ORGANIC COMPOUNDS DETECTED IN SOIL SAMPLES
(Sheet 1 of 3)

Parameter Reported	MW530-1 07/13/90 2.5-3 ft	MW530-1 07/13/90 6-6.5 ft	MW530-1 07/13/90 8.5-9 ft	MW530-1 07/13/90 11.5-12 ft	MW530-1 07/13/90 13.5-14 ft	MW530-2 07/13/90 2-2.5 ft	MW530-2 07/13/90 5-5.5 ft
Volatile Organic Compounds							
Methylene Chloride (ug/kg)	<6.00	<6.00	53	1800	11	6	5
Acetone (ug/kg)	<12.0	30	91	<1500	<14.0	<12.0	<11.0
Toluene (ug/kg)	77	8	38	<750	140	72	<5.00
Ethylbenzene (ug/kg)	<6.00	<6.00	36	6200	<7.00	<6.00	<5.00
Xylenes (total) (ug/kg)	<6.00	<6.00	170	12000	11	<6.00	<5.00

	MW530-1 07/13/90 1-1.5 ft	MW530-1 07/13/90 3-3.5 ft	MW530-1 07/13/90 7.5-8 ft	MW530-1 07/13/90 12-12.5 ft	MW530-1 07/13/90 14-14.5 ft	MW530-2 07/13/90 2.5-3 ft	MW530-2 07/13/90 5.5-6 ft
Semivolatile Compounds							
2-Methylnaphthalene (ug/kg)	<690	<700	<1800	41000	<820	<340	<350
Di-n-butylphthalate (ug/kg)	1600	3800	4500	<16000	12000	1000	610
Pyrene (ug/kg)	<690	<700	<1800	<16000	<820	<340	<350

Notes: NA = Not Analyzed
< = Detection Limit
ug/kg = micrograms per kilogram
Data not validated by JMM

TABLE 11-3

SITE 10B - BUILDING 530, MISSILE REWORK OPERATIONS
RESULTS FOR VOLATILE AND SEMIVOLATILE ORGANIC COMPOUNDS DETECTED IN SOIL SAMPLES
(Sheet 2 of 3)

Parameter Reported	MW530-2 07/13/90 8-8.5 ft	MW530-2 07/13/90 11-11.5 ft	MW530-2 07/13/90 14-14.5 ft	MW530-3 07/13/90 2-2.5 ft	MW530-3 07/13/90 4-4.5 ft	MW530-3 07/13/90 7-7.5 ft	MW530-3 07/13/90 10-10.5 ft
Volatile Organic Compounds							
Methylene Chloride (ug/kg)	11	7	6	<29.0	7	<6.00	7
Acetone (ug/kg)	<12.0	18	<10.0	<59	<11.0	<12.0	18
Toluene (ug/kg)	8	10	31	1100	<6.00	30	22
Ethylbenzene (ug/kg)	<6.00	<6.00	<5.00	<29.0	<6.00	<6.00	<6.00
Xylenes (total) (ug/kg)	<6.00	<6.00	<5.00	<29.0	<6.00	<6.00	<6.00

	MW530-2 07/13/90 8.5-9 ft	MW530-2 07/13/90 11.5-12 ft	MW530-2R 07/13/90 6-6.5 ft	MW530-3 07/13/90 2.5-3 ft	MW530-3 07/13/90 5-5.5 ft	MW530-3 07/13/90 8-8.5 ft	MW530-3 07/13/90 12.5-13 ft
Semivolatile Compounds							
2-Methylnaphthalene (ug/kg)	<420	<780	<400	<340	<400	<820	<870
Di-n-butylphthalate (ug/kg)	600	4300	400	700	560	920	5400
Pyrene (ug/kg)	<420	970	<400	<340	<400	<820	<870

Notes: NA = Not Analyzed
< = Detection Limit
ug/kg = micrograms per kilogram
Data not validated by JMM

TABLE 11-3

SITE 10B - BUILDING 530, MISSILE REWORK OPERATIONS
RESULTS FOR VOLATILE AND SEMIVOLATILE ORGANIC COMPOUNDS DETECTED IN SOIL SAMPLES
(Sheet 3 of 3)

Parameter Reported	MW530-3 07/13/90 11.5-12 ft
Volatile Organic Compounds	
Methylene Chloride (ug/kg)	9
Acetone (ug/kg)	<12.0
Toluene (ug/kg)	<6.00
Ethylbenzene (ug/kg)	<6.00
Xylenes (total) (ug/kg)	<6.00

	MW530-3R 07/13/90 8.5-9 ft
Semivolatile Compounds	
2-Methylnaphthalene (ug/kg)	<800
Di-n-butylphthalate (ug/kg)	1900
Pyrene (ug/kg)	<800

Notes: NA = Not Analyzed
< = Detection Limit
ug/kg = micrograms per kilogram
Data not validated by JMM

TABLE 11-4

SITE 10B - BUILDING 530, MISSILE REWORK OPERATIONS
RESULTS FOR TOTAL RECOVERABLE PETROLEUM HYDROCARBONS DETECTED IN SOIL SAMPLES

Parameter Reported	MW530-1 07/13/90 2.5-3 ft	MW530-1 07/13/90 5.5-6 ft	MW530-1 07/13/90 6-6.5 ft	MW530-1 07/13/90 8.5-9 ft	MW530-1 07/13/90 11.5-12 ft	MW530-1 07/13/90 13.5-14 ft	MW530-2 07/13/90 2-2.5 ft
TRPH (mg/kg)	170	5.2	103	7460	7560	35.3	31.3

Parameter Reported	MW530-2 07/13/90 14-14.5 ft	MW530-3 07/13/90 2-2.5 ft	MW530-3 07/13/90 11.5-12 ft
TRPH (mg/kg)	10.5	39.5	8.7

Notes: NA = Not Analyzed
< = Detection Limit
mg/kg = milligrams per kilogram
Data not validated by JMM

TABLE 11-5

SITE 10B - BUILDING 530, MISSILE REWORK OPERATIONS
RESULTS FOR METALS DETECTED IN SOIL SAMPLES
(Sheet 1 of 3)

Parameter Reported	MW530-1 07/13/90 1-1.5 ft	MW530-1 07/13/90 3-3.5 ft	MW530-1 07/13/90 6.5-7 ft	MW530-1 07/13/90 7.5-8 ft	MW530-1 07/13/90 9-9.5 ft	MW530-1 07/13/90 12-12.5 ft	MW530-1 07/13/90 14-14.5 ft
Aluminum (mg/kg)	7000	3710	6200	5240	1700	7730	370
Arsenic (mg/kg)	<10.0	<11.0	<12.0	<13.0	<13.0	12	<12.0
Barium (mg/kg)	88	53	41	42	120	60	64
Cadmium (mg/kg)	1.2	<1.10	<1.20	<1.30	<1.30	<1.20	<1.20
Calcium (mg/kg)	9000	5000	3700	15000	1400	1700	710
Chromium (mg/kg)	23	22	31	23	18	45	<6.20
Cobalt (mg/kg)	5.6	<5.30	<5.90	<6.60	<6.40	<5.90	<6.20
Copper (mg/kg)	23	18	42	37	24	11	20
Iron (mg/kg)	11500	7260	12200	13100	15500	10700	1500
Lead (mg/kg)	31	59	15	25	15	<5.90	18
Magnesium (mg/kg)	3200	1900	3200	2200	<640	2200	<620
Manganese (mg/kg)	210	90	110	100	13	54	<6.20
Nickel (mg/kg)	20	21	38	25	<6.40	25	<6.20
Potassium (mg/kg)	2100	550	1200	750	770	1400	<620
Sodium (mg/kg)	<520	<530	770	<660	690	660	<620
Titanium (mg/kg)	661	330	400	310	2540	420	330
Vanadium (mg/kg)	21	16	22	16	12	42	<6.20
Zinc (mg/kg)	79	56	48	54	19	22	10

Notes: NA = Not Analyzed
< = Detection Limit
mg/kg = milligrams per kilogram
Data not validated by JMM

TABLE 11-5

SITE 10B - BUILDING 530, MISSILE REWORK OPERATIONS
RESULTS FOR METALS DETECTED IN SOIL SAMPLES
(Sheet 2 of 3)

Parameter Reported	MW530-2 07/13/90 0.5-1 ft	MW530-2 07/13/90 2.5-3 ft	MW530-2 07/13/90 5.5-6 ft	MW530-2 07/13/90 8.5-9 ft	MW530-2 07/13/90 11.5-12 ft	MW530-2 07/13/90 14.5-15 ft	MW530-2R 07/13/90 6-6.5 ft
Aluminum (mg/kg)	4290	3130	3180	3720	3400	5700	3930
Arsenic (mg/kg)	<11.0	<10.0	<11.0	<13.0	<12.0	<13.0	<12.0
Barium (mg/kg)	34	300	<21.0	<25.0	<24.0	34	28
Cadmium (mg/kg)	<1.10	<1.00	<1.10	<1.30	<1.20	<1.30	<1.20
Calcium (mg/kg)	4600	17000	2900	1600	1400	2600	2700
Chromium (mg/kg)	26	19	19	20	20	28	23
Cobalt (mg/kg)	<5.30	<5.20	<5.40	<6.30	<5.90	<6.30	<6.10
Copper (mg/kg)	29	9.1	7.7	11	10	14	32
Iron (mg/kg)	6890	4860	5210	6740	6770	10700	7070
Lead (mg/kg)	6.4	<5.20	<5.40	<6.30	<5.90	<6.30	<6.10
Magnesium (mg/kg)	2100	1700	1700	2100	1900	3200	2300
Manganese (mg/kg)	89	80	71	76	71	120	82
Nickel (mg/kg)	22	17	19	23	21	31	23
Potassium (mg/kg)	680	<520	<540	660	600	1100	690
Sodium (mg/kg)	<530	<520	<540	680	1000	2400	<610
Titanium (mg/kg)	340	290	290	330	280	320	320
Vanadium (mg/kg)	16	14	13	14	13	20	15
Zinc (mg/kg)	31	21	17	20	21	30	30

Notes: NA = Not Analyzed
< = Detection Limit
mg/kg = milligrams per kilogram
Data not validated by JMM

TABLE 11-5

SITE 10B - BUILDING 530, MISSILE REWORK OPERATIONS
RESULTS FOR METALS DETECTED IN SOIL SAMPLES
(Sheet 3 of 3)

Parameter Reported	MW530-3 07/13/90 0.5-1 ft	MW530-3 07/13/90 2.5-3 ft	MW530-3 07/13/90 5-5.5 ft	MW530-3 07/13/90 8-8.5 ft	MW530-3 07/13/90 10.5-11 ft	MW530-3 07/13/90 12.5-13 ft	MW530-3R 07/13/90 8.5-9 ft
Aluminum (mg/kg)	3350	2880	3800	4680	17000	6930	3720
Arsenic (mg/kg)	<11.0	<10.0	<12.0	<12.0	<14.0	<13.0	<12.0
Barium (mg/kg)	47	25	<24.0	26	78	37	<24.0
Cadmium (mg/kg)	<1.10	<1.00	<1.20	<1.20	<1.40	<1.30	<1.20
Calcium (mg/kg)	9900	25000	3100	2000	3600	5200	1600
Chromium (mg/kg)	31	18	23	27	61	29	21
Cobalt (mg/kg)	<5.30	<5.20	<6.00	<6.20	12	<6.60	<6.00
Copper (mg/kg)	14	19	7.5	8	71	26	6.8
Iron (mg/kg)	5820	4690	6460	7860	26600	11200	6700
Lead (mg/kg)	<5.30	<5.20	<6.00	<6.20	18	8.8	<6.00
Magnesium (mg/kg)	1800	1600	1800	2500	7500	3200	2200
Manganese (mg/kg)	82	80	76	85	300	140	75
Nickel (mg/kg)	20	17	19	25	71	30	22
Potassium (mg/kg)	<530	<520	<600	780	2500	1100	640
Sodium (mg/kg)	600	550	<600	<620	3400	1300	<600
Titanium (mg/kg)	280	280	360	360	640	380	310
Vanadium (mg/kg)	15	12	16	17	48	22	14
Zinc (mg/kg)	23	22	17	22	130	41	21

Notes: NA = Not Analyzed
< = Detection Limit
mg/kg = milligrams per kilogram
Data not validated by JMM

TABLE 11- 6

SITE 10B - BUILDING 530, MISSILE REWORK OPERATIONS
RESULTS FOR GENERAL CHEMICAL CHARACTERISTICS IN SOIL SAMPLES

Parameter Reported	MW530-1 07/13/90 3-3.5 ft	MW530-2 07/13/90 2.5-3 ft	MW530-3 07/13/90 2.5-3 ft
pH (Units)	9.2	9.2	9.1

Notes: NA = Not Analyzed
< = Detection Limit
Data not validated by JMM

TABLE 11-7

SITE 10B - BUILDING 530, MISSILE REWORK OPERATIONS
RESULTS FOR VOLATILE ORGANIC COMPOUNDS DETECTED IN GROUNDWATER SAMPLES

Parameter Reported	214 08/23/90 0-0 ft	215 08/24/90 0-0 ft	217 08/24/90 0-0 ft	218 08/24/90 0-0 ft	MW530-1 08/23/90 0-0 ft	MW530-2 08/23/90 0-0 ft	MW530-3 08/24/90 0-0 ft
Methylene Chloride (ug/L)	8	11	12	13	7	7	12
Benzene (ug/L)	<5.00	<5.00	<5.00	<5.00	19	<5.00	<5.00
Toluene (ug/L)	<5.00	<5.00	<5.00	<5.00	7	<5.00	<5.00
Ethylbenzene (ug/L)	<5.00	<5.00	<5.00	<5.00	79	<5.00	<5.00
Xylenes (total) (ug/L)	<5.00	<5.00	<5.00	<5.00	190	<5.00	<5.00

Notes: NA = Not Analyzed
< = Detection Limit
ug/L = micrograms per liter
Data not validated by JMM
200-series numbers as well or boring name indicate a travel blank

TABLE 11-8

SITE 10B - BUILDING 530, MISSILE REWORK OPERATIONS
RESULTS FOR SEMIVOLATILE ORGANIC COMPOUNDS AND PETROLEUM HYDROCARBONS
DETECTED IN GROUNDWATER SAMPLES

Parameter Reported	MW530-1 08/23/90 0-0 ft	MW530-3 08/24/90 0-0 ft
Semivolatile Compounds		
Naphthalene (ug/L)	250	NA
2-Methylnaphthalene (ug/L)	390	NA
Hydrocarbon Compounds		
Oil & Grease (mg/L)	48	<5.00
TRPH (mg/L)	72.6	0.18

Notes: NA = Not Analyzed
< = Detection Limit
ug/L = micrograms per liter
mg/L = milligrams per liter
Data not validated by JMM

TABLE 11-9

SITE 10B - BUILDING 530, MISSILE REWORK OPERATIONS
RESULTS FOR METALS DETECTED IN GROUNDWATER SAMPLES

Parameter Reported	MW530-1 08/23/90 0-0 ft	MW530-2 08/23/90 0-0 ft	MW530-3 08/24/90 0-0 ft
Aluminum (mg/L)	54	92	129
Arsenic (mg/L)	0.057	<0.050	0.11
Barium (mg/L)	2.4	0.47	0.53
Cadmium (mg/L)	<0.005	<0.005	0.0065
Calcium (mg/L)	129	43	107
Chromium (mg/L)	0.34	0.3	0.4
Cobalt (mg/L)	<0.050	0.063	0.073
Copper (mg/L)	0.16	0.17	0.19
Iron (mg/L)	162	141	160
Lead (mg/L)	0.36	0.11	<0.200
Magnesium (mg/L)	33	45	56
Manganese (mg/L)	0.77	1.7	2.4
Nickel (mg/L)	0.17	0.35	0.45
Potassium (mg/L)	30	26	25
Selenium (mg/L)	0.068	<0.100	<0.050
Silver (mg/L)	0.018	<0.010	<0.010
Sodium (mg/L)	274	237	65
Titanium (mg/L)	12	2.4	3.5
Vanadium (mg/L)	0.3	0.3	0.33
Zinc (mg/L)	0.28	0.36	0.44

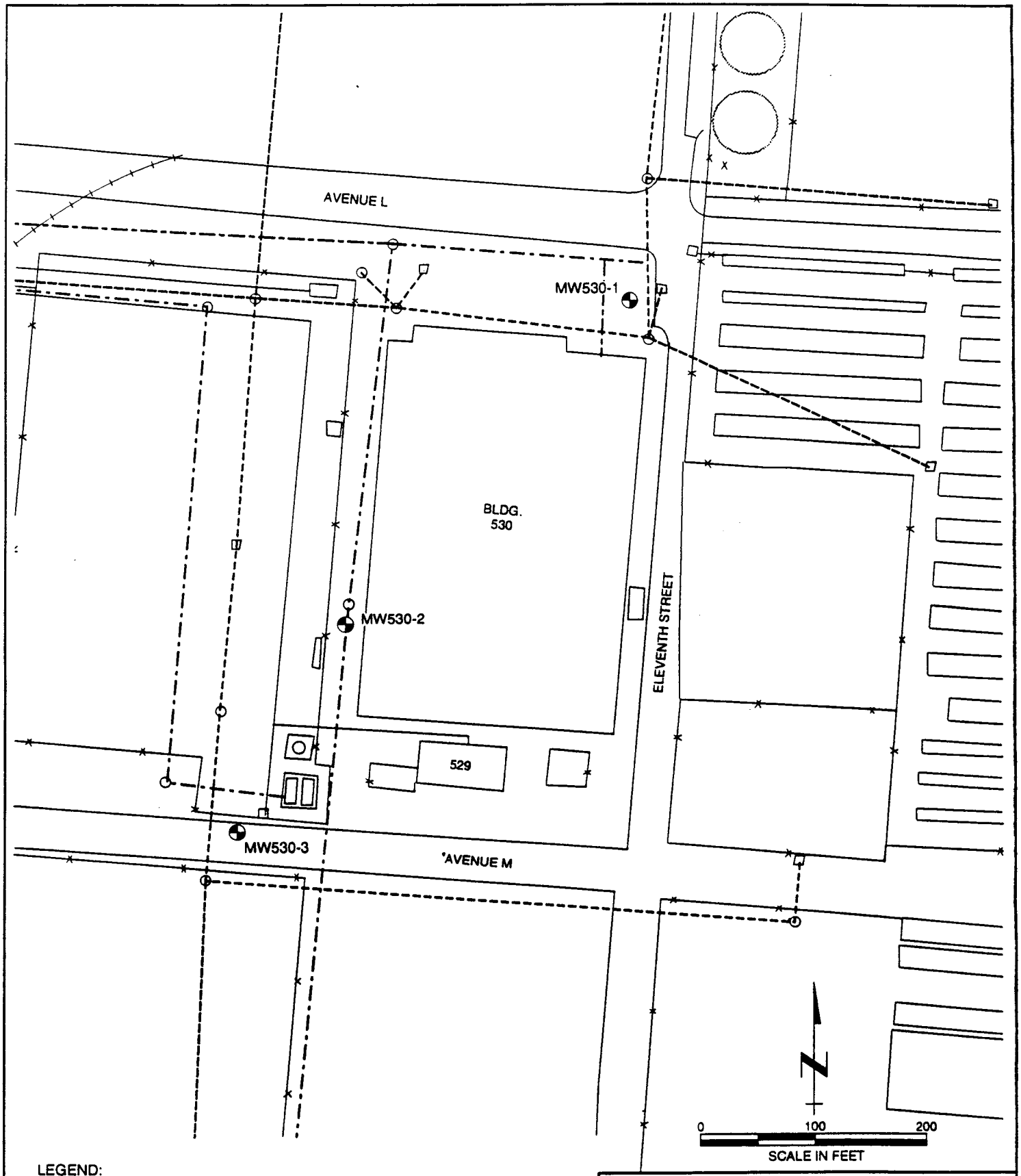
Notes: NA = Not Analyzed
< = Detection Limit
mg/L = milligrams per liter
Data not validated by JMM

TABLE 11-10

SITE 10B - BUILDING 530, MISSILE REWORK OPERATIONS
RESULTS FOR GENERAL CHEMICAL CHARACTERISTICS IN GROUNDWATER

Parameter Reported	MW530-1 08/23/90 0-0 ft	MW530-2 08/23/90 0-0 ft	MW530-3 08/24/90 0-0 ft
Miscellaneous Measurements			
Alkalinity, bicarb (as CaCO3) (mg/L)	380	680	NA
Alkalinity, carb (as CaCO3) (mg/L)	30	<5.00	NA
Alkalinity, total (as CaCO3) (mg/L)	410	680	NA
Chloride (mg/L)	73	71	63
Sulfate (mg/L)	16	195	25
Total Dissolved Solids (mg/L)	970	1370	610
Total Hardness (as CaCO3) (mg/L)	NA	NA	498
Total Organic Carbon			
Total Organic Carbon (mg/L)	22.9	95	28.3
Characteristic Measurements			
Dissolved Oxygen (mg/L)	1.2	2.8	3.4
pH (Units)	8.3	6.7	7.6
Cations/Anions			
Specific Conductivity (umhos)	1050	1880	900

Notes: NA = Not Analyzed
< = Detection Limit
mg/L = milligrams per liter
umhos = micromhos per centimeter
Data not validated by JMM



LEGEND:

- Canonie Monitoring Well Location
- Fence
- Sanitary Sewer Line
- Storm Sewer Line
- Railroad
- Manhole
- Catch Basin

NOTE:
Boring and monitoring well locations were obtained from a base map provided by Canonie Environmental, Inc. The individual locations were digitized onto a base map CAD file provided by NAS Alameda.

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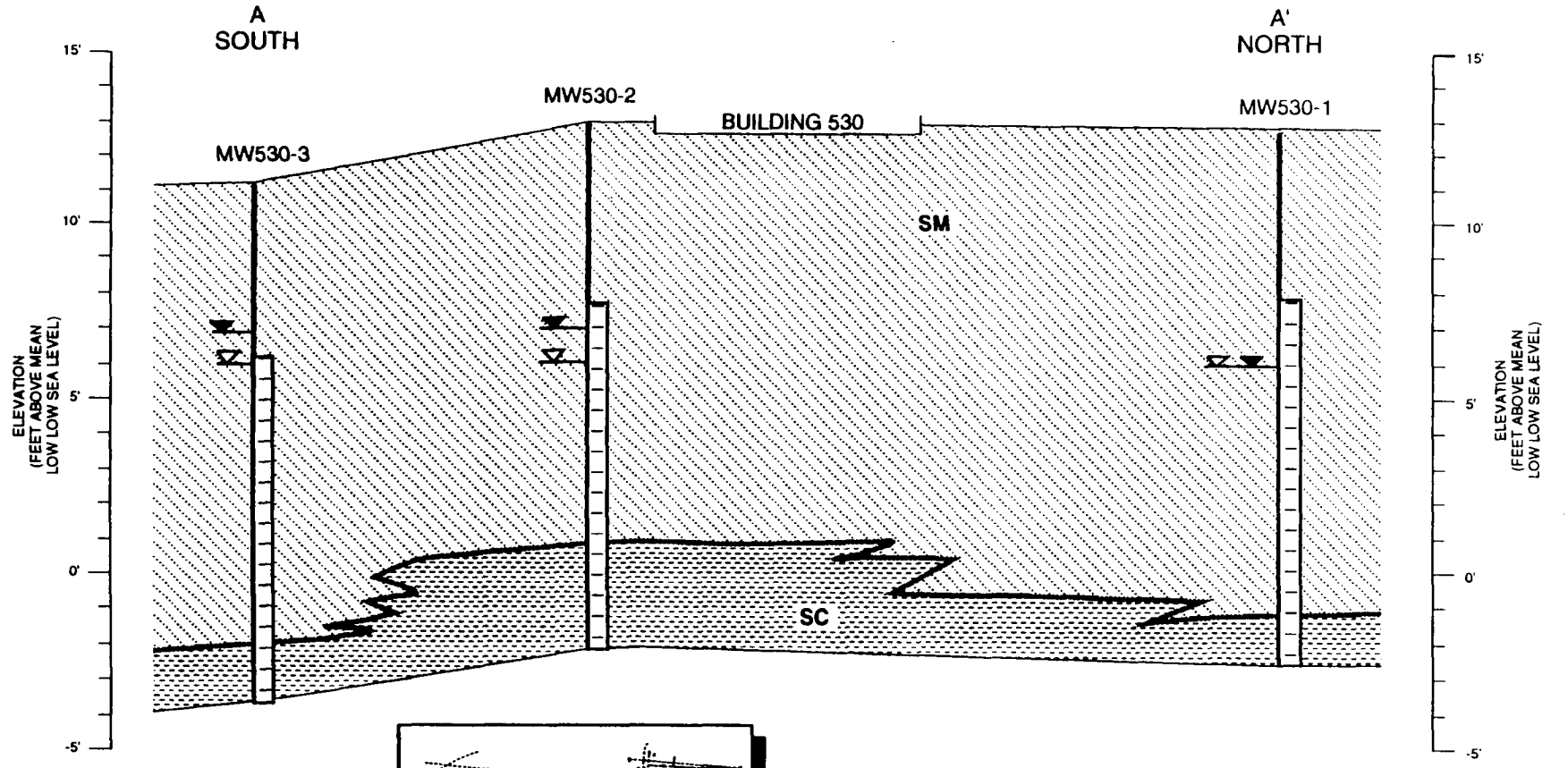
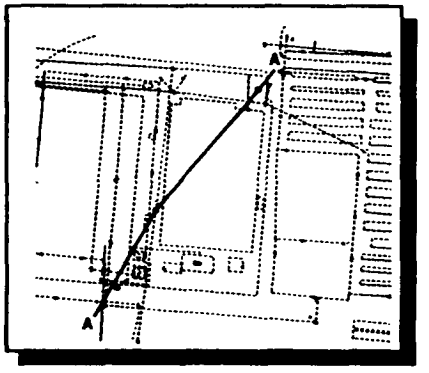
NAVAL AIR STATION ALAMEDA
ALAMEDA, CALIFORNIA
SITE 10B - BUILDING 530,
MISSILE REWORK OPERATIONS
CANONIE MONITORING WELL LOCATIONS

FIGURE 11-1





This cross section is based on logs of wells and borings drilled and logged by Canonie Environmental, Inc. All water levels were measured by Canonie Environmental, Inc.

LEGEND:

- SM Silty Sand
- SC Clayey Sand
- Approximate Fill/Native Sediment Interface
- Water Level During Water Sampling
- First Water During Drilling
- Monitoring Well
- Screened Interval

Scale in Feet
Vertical Exaggeration 20:1

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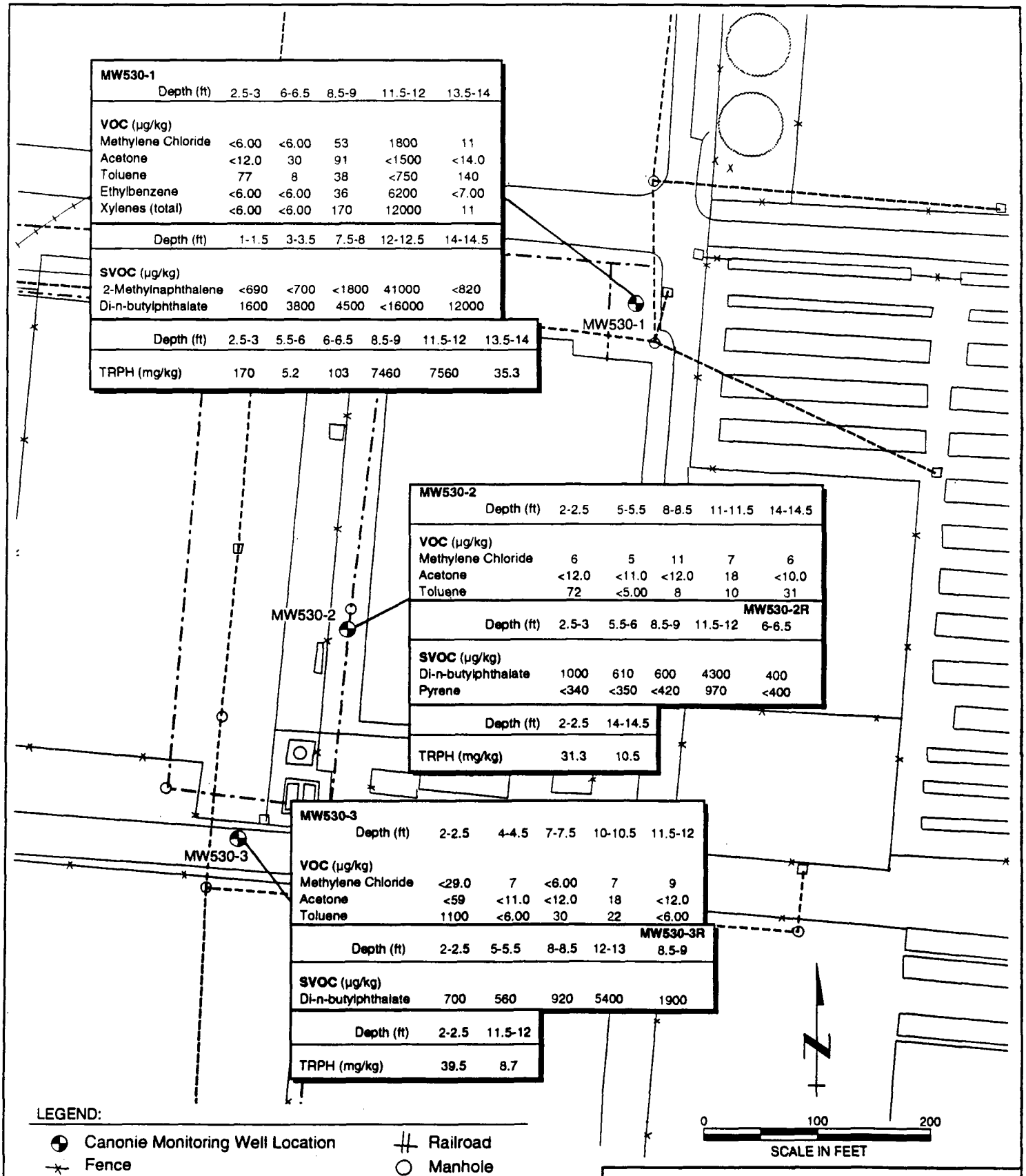
NAVAL AIR STATION ALAMEDA
ALAMEDA, CALIFORNIA
SITE 10B - BUILDING 530,
MISSILE REWORK OPERATIONS
GEOLOGIC CROSS SECTION A-A'

FIGURE 11-2



LEGEND:

- Canonie Monitoring Well Location
- Fence
- Sanitary Sewer Line
- Storm Sewer Line
- Railroad
- Manhole
- Catch Basin

NOTES:

Boring and monitoring well locations were obtained from a base map provided by Canonie Environmental, Inc. The individual locations were digitized onto a base map CAD file provided by NAS Alameda.

All data shown on figures is from the Canonie investigation and reflects detections only. At present, data has not been independently validated, and laboratory qualifers are not shown.

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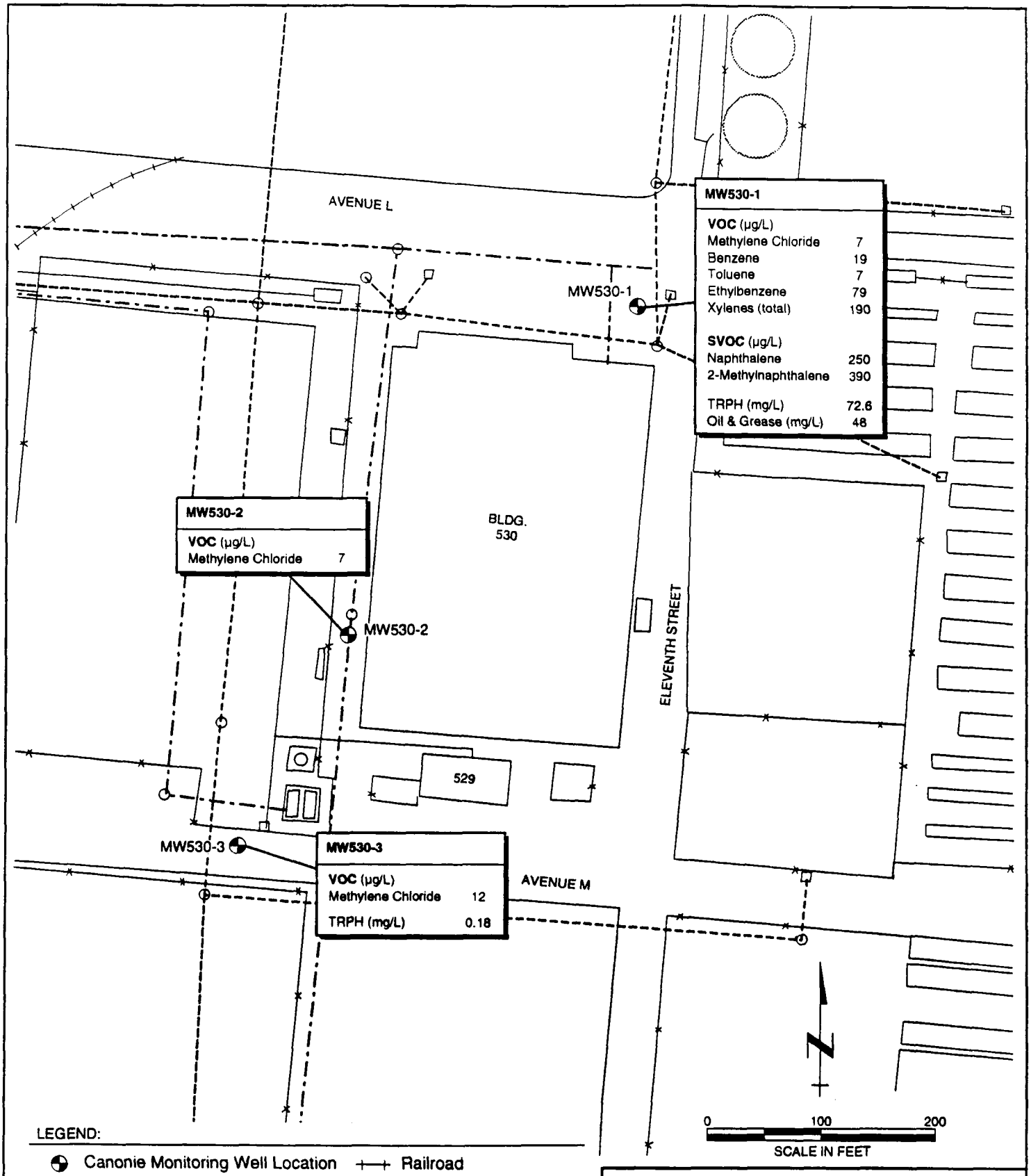
NAVAL AIR STATION ALAMEDA
ALAMEDA, CALIFORNIA

SITE 10B - BUILDING 530, MISSILE REWORK OPERATIONS VOLATILE AND SEMIVOLATILE ORGANIC COMPOUNDS AND TRPH IN SOIL

FIGURE 11-3



LEGEND:

- Canonie Monitoring Well Location
- Fence
- Sanitary Sewer Line
- Storm Sewer Line
- Railroad
- Manhole
- Catch Basin

NOTES:

Boring and monitoring well locations were obtained from a base map provided by Canonie Environmental, Inc. The individual locations were digitized onto a base map CAD file provided by NAS Alameda.

All data shown on figures is from the Canonie investigation and reflects detections only. At present, data has not been independently validated, and laboratory qualifers are not shown.

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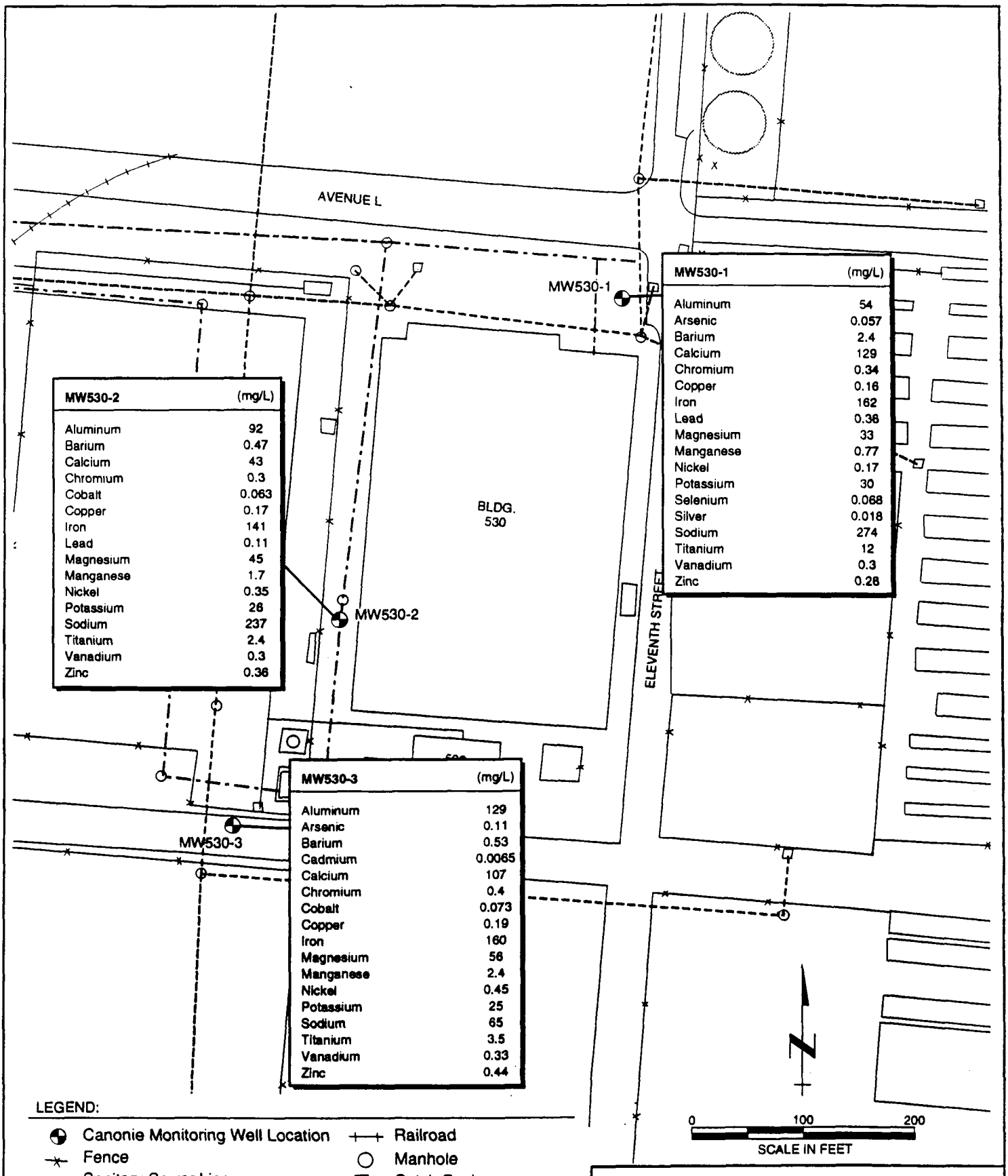
NAVAL AIR STATION ALAMEDA
ALAMEDA, CALIFORNIA

SITE 10B - BUILDING 530, MISSILE REWORK OPERATIONS VOLATILE AND SEMIVOLATILE ORGANIC COMPOUNDS, TRPH AND OIL AND GREASE IN GROUNDWATER

FIGURE 11-4



LEGEND:

- Canonie Monitoring Well Location
- Fence
- Sanitary Sewer Line
- Storm Sewer Line
- Railroad
- Manhole
- Catch Basin

NOTES:

Boring and monitoring well locations were obtained from a base map provided by Canonie Environmental, Inc. The individual locations were digitized onto a base map CAD file provided by NAS Alameda.

All data shown on figures is from the Canonie investigation and reflects detections only. At present, data has not been independently validated, and laboratory qualifers are not shown.

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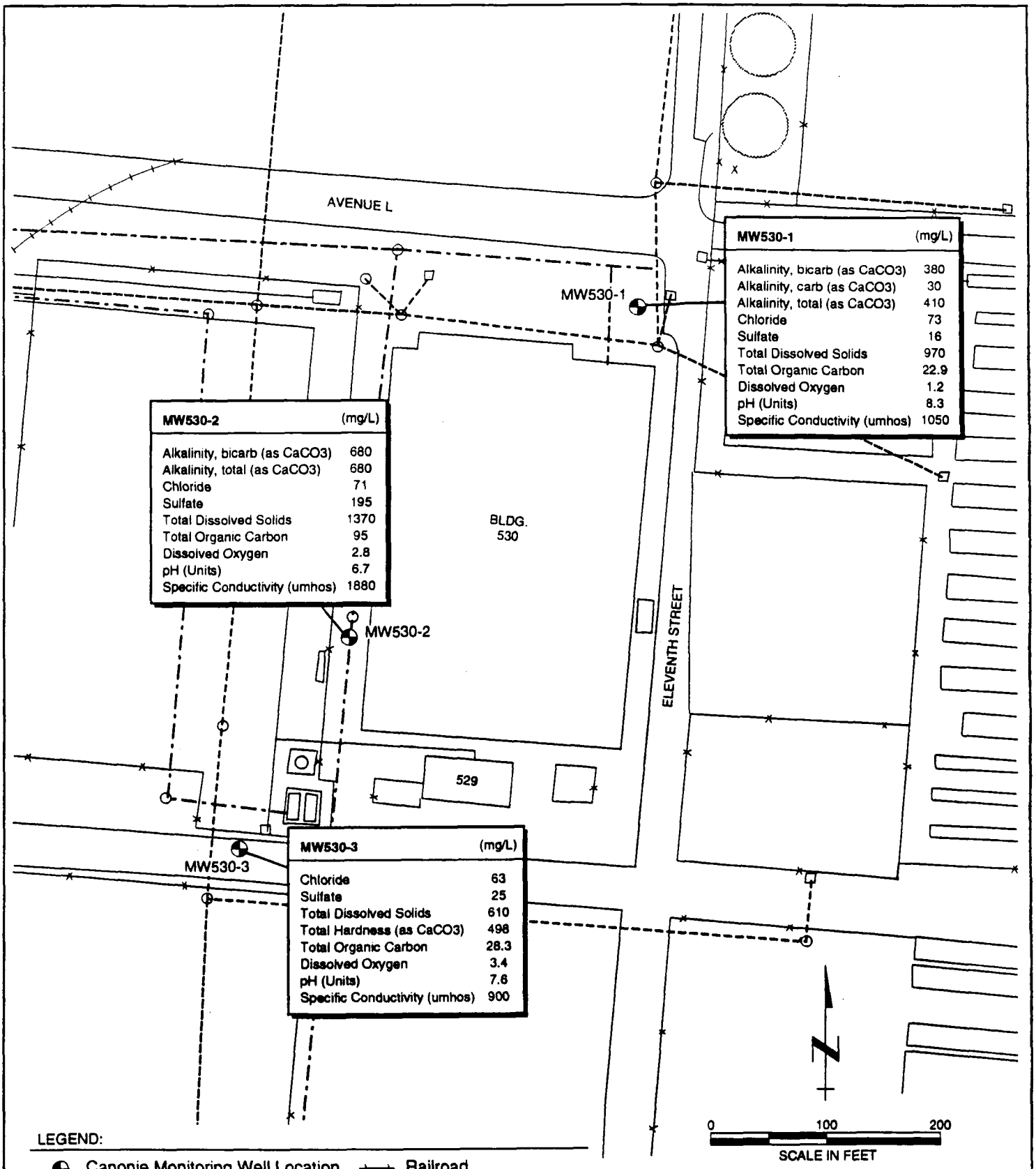
NAVAL AIR STATION ALAMEDA
ALAMEDA, CALIFORNIA

SITE 10B - BUILDING 530, MISSILE REWORK OPERATIONS METALS IN GROUNDWATER

FIGURE 11-5



MW530-1	(mg/L)
Alkalinity, bicarb (as CaCO3)	380
Alkalinity, carb (as CaCO3)	30
Alkalinity, total (as CaCO3)	410
Chloride	73
Sulfate	16
Total Dissolved Solids	970
Total Organic Carbon	22.9
Dissolved Oxygen	1.2
pH (Units)	8.3
Specific Conductivity (umhos)	1050

MW530-2	(mg/L)
Alkalinity, bicarb (as CaCO3)	680
Alkalinity, total (as CaCO3)	680
Chloride	71
Sulfate	195
Total Dissolved Solids	1370
Total Organic Carbon	95
Dissolved Oxygen	2.8
pH (Units)	6.7
Specific Conductivity (umhos)	1880

MW530-3	(mg/L)
Chloride	63
Sulfate	25
Total Dissolved Solids	610
Total Hardness (as CaCO3)	498
Total Organic Carbon	28.3
Dissolved Oxygen	3.4
pH (Units)	7.6
Specific Conductivity (umhos)	900

LEGEND:

- Canonie Monitoring Well Location
- Fence
- Sanitary Sewer Line
- Storm Sewer Line
- Railroad
- Manhole
- Catch Basin

NOTES:
Boring and monitoring well locations were obtained from a base map provided by Canonie Environmental, Inc. The individual locations were digitized onto a base map CAD file provided by NAS Alameda.

All data shown on figures is from the Canonie investigation and reflects detections only. At present, data has not been independently validated, and laboratory qualifers are not shown.

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NAVAL AIR STATION ALAMEDA
ALAMEDA, CALIFORNIA
SITE 10B - BUILDING 530,
MISSILE REWORK OPERATIONS
GENERAL CHEMICAL CHARACTERISTICS OF GROUNDWATER

FIGURE 11-6

12.0 SITE 13 - FORMER OIL REFINERY

12.1 SITE DESCRIPTION AND BACKGROUND

Site 13 (Initial Assessment Study Site 11) consists of approximately 30 acres located in the southeast corner of the present-day station (Figure 1-2). This site was formerly occupied by the Pacific Coast Oil Works refinery, which operated between 1879 and 1903. Refinery wastes and asphaltic residues were dumped at the site during the period in which the refinery operated (E&E, 1983).

The refinery consisted of pump and lubricating houses, stills, two laboratories, and agitators, as well as approximately 19 aboveground iron oil storage tanks, six underground iron storage tanks and a storage area containing drums of oil (Sanborn, 1897). The approximate locations of these facilities are shown in Figure 12-1.

The area once occupied by the oil refinery was later surfaced by the Navy. The resulting vapor pressure buildup from underground hydrocarbons and refinery wastes induced surface rupture sometime in the 1940s. An area approximately 30 feet by 30 feet was excavated and a concrete slab was emplaced in the bottom of the excavation, which was then backfilled and resurfaced. No information was provided as to the location of the excavated area. These procedures apparently mitigated the problem of vapor pressure build-up (E&E, 1983).

12.2 OTHER INVESTIGATIONS

In 1989, the Navy contracted Harding Lawson Associates (HLA) to conduct a geotechnical investigation in preparation for construction of two proposed buildings. The buildings were to be located south and southeast of Building 397, which is located within the former oil refinery site, and were known as the Intermediate Maintenance Facility (IMF). As part of their investigation, HLA drilled 18 soil borings to depths between 5 and 11.5 feet bgs and installed one groundwater monitoring well to a depth of 16.5 feet bgs in one of the borings. Figure 12-2 shows the approximate locations of these borings. Free hydrocarbon product was encountered in one boring and hydrocarbon stains or odors were noted in nine borings. Nineteen soil samples were submitted for analysis of TPH, and 15 soil samples were analyzed for oil and grease. Eleven soils samples contained detectable concentrations of TPH ranging between 51 and 76,000 mg/kg; 11 soil samples contained oil and grease concentrations between 720 and 120,000 mg/kg. The sample from 4.5 feet bgs in boring B-7 reported the two highest concentrations cited above. This sample also contained an elevated lead content (13,000 mg/kg) and a pH of 1.6.

As a result of these findings, the Navy was directed by the DTSC to initiate soil removal in the vicinity of boring B-7. The PRC team was contracted by the Navy in 1991 to perform an additional assessment of the extent of lead contamination and low pH soils around boring B-7. Eight soil borings were drilled to depths between 9.5 and 10.5 feet bgs and one monitoring well was installed to a depth of 14 feet bgs. Figure 12-3 shows the locations of these borings. Hydrocarbon stains and odors were noted in all borings and 0.7 feet of free hydrocarbon product accumulated in the monitoring well following installation.

Although the focus of this Phase I investigation was to determine the extent of elevated lead concentrations, seven soil samples were analyzed for TRPH, three samples were analyzed for VOCs, and three samples were analyzed for SVOCs. TRPH concentrations ranged between 37.8 mg/kg and 71,200 mg/kg. With the exception of one soil sample collected at 8 feet bgs from B-IMF-01, no leachable VOCs or SVOCs by the Toxic Characteristic Leaching Procedure (TCLP) method were detected in the samples submitted for the analyses. The soil sample from B-IMF-01 contained 2.9 μg/L of leachable benzene. The maximum lead concentration encountered was 602 mg/kg, and no pH values below 4.0 were recorded.

Due to discrepancies between field pH screening results and laboratory results for two of the samples collected in the Phase I investigation, the DTSC requested additional pH sampling. A Phase II field investigation was conducted by the PRC team to study the soil pH. Samples were collected from surface soils immediately adjacent to each of the eight Phase I soil borings. Subsurface samples were collected immediately adjacent to borings B-IMF-04, B-IMF-06, and HLA's boring B-7. Two samples were collected from each site; one sample was submitted for laboratory analysis of pH by EPA Method 9040, and the remaining sample was field screened for pH using four different procedures (PRC/JMM, 1992b). Laboratory and field pH measurements were generally consistent. The result of pH analysis of subsurface soil adjacent to boring B-7 reported low soil pH values of 0.9 to 2.2 pH units.

The Phase II investigation confirmed the low pH near boring B-7 but did not fully characterize the extent of the low pH levels. At the request of the DTSC, an additional soil and groundwater investigation (Phase III) was performed at the IMF site. For the Phase III investigation, the PRC team drilled three soil borings (B-IMF-09 through B-IMF-11) and installed one additional groundwater monitoring well (B-IMF-02) (Figure 12-3). The focus of the investigation was to further evaluate the pH and the extent of lead in the immediate vicinity of boring B-7. The Phase III investigation also included an evaluation of areal groundwater flow direction, which was to the west based on water level data collected during April 1992 (PRC/JMM, 1992b). Oil-soaked sands and a hydrocarbon odor were frequently encountered during the drilling of the soil borings. Tar- or coal-like materials were present in a number of the soil core samples. The Phase III investigation concluded that low pH soils were common within a 6-foot radius of boring B-7. The occurrence of low pH values may be related to the presence of a tar-like or oily material that contains acid constituents.

The low pH did not appear to influence regional soil or groundwater quality. Three of four groundwater samples collected from wells M-IMF-01 and M-IMF-02 and borings B-IMF-09 and B-IMF-10 (HydroPunch samples) had low pH and elevated levels of lead. High lead levels were also identified in soil samples in close proximity to boring B-7. In general, the low pH and elevated lead concentrations correlated with the presence of a black, tar-like material.

12.3 CURRENT USE

Several Naval facilities now exist on the site of the former oil refinery, many of which are separate Phases 1 and 2A sites. As shown in Figure 1-2, a former on-base annex service station, Building 547 (Site 7C), is located in the northeast corner of the former oil refinery area. In the northwest corner is a hazardous waste storage yard (Site 19), which is currently in operation. A missile rework facility is housed in Building 530 (Site 10B) which is located in the southern portion of the former oil refinery area. Empty lots make up a large portion of the central portion of the site. The empty lots south of Building 397 are the proposed site of the IMF.

12.4 REMEDIAL INVESTIGATION

The investigation conducted by Canonie in 1990 at Site 13 included the drilling of 27 borings, installation of monitoring wells in five of the borings, and soil and groundwater sampling. Figure 12-4 shows the locations of the 22 borings and 5 monitoring wells installed by Canonie. The focus of the investigation at Site 13 was to determine if residual chemicals from the refinery operation were leaching into the groundwater. Table 12-1 list the samples collected and the analyses performed at Site 13.

12.4.1 Site Geology/Hydrogeology

Twenty-seven borings were drilled by Canonie at Site 13, five of which were converted to monitoring wells. Figure 12-4 shows the locations of the Canonie borings. Boring logs and construction details are presented in Appendix C. The results of the geotechnical laboratory tests are listed on Table 12-2 and provided in Appendix D. Figure 12-5 shows cross sections of the subsurface stratigraphy along the northern and eastern border of the site.

The artificial fill is approximately 10 feet thick at the western edge of the site and thins eastward to approximately 5 feet in thickness. The artificial fill predominantly consists of dark brown to brown, silty fine sand and clayey fine sand with minor amounts of clay and gravel. Bay Mud deposits underlie the fill in ten of the 27 borings drilled at the site; they are evident beneath the western portion and at the southeast corner of Site

13. Where present, the Bay Mud Unit is typically encountered between 9 and 11 feet bgs and consists of a dark gray silty clay with iron oxide stains near the top. Merritt Sand deposits underlie the Bay Mud Unit in seven borings; it occurs at approximately 12 feet bgs in places where it is overlain by the Bay Mud. In the places where the Merritt Sand is directly overlain by artificial fill, it occurs at depths between 5 and 11 feet bgs. The Merritt Sand consists predominantly of orange-brown silty to clayey fine sand.

Groundwater is encountered beneath the site at approximately 6 feet below grade. A groundwater gradient map constructed from water level measurements taken by Canonie on November 8, 1990 is shown in Figure 2-4. The local groundwater gradient at that time was toward the southwest at approximately 0.002 foot/foot. Groundwater elevation data for different dates or times are not available to determine tidal influences beneath the site.

12.4.2 Analytical Results - Soil Samples

A total of 281 soil samples for Site 13 were collected from 22 soil borings and during the drilling of five monitoring wells. At each boring, samples were collected at 1- to 1.5-foot intervals. Surface and subsurface soil samples were selectively analyzed for VOCs, SVOCs, TRPH, TPH as diesel, pesticide and PCB compounds, metals, and general chemical characteristics. Additionally, subsurface samples were analyzed for VOCs and TRPH. Table 12-1 provides a summary of analyses by sample. The analytical results are summarized in Tables 12-3 through 12-8 and Figures 12-6 through 12-12. The figures and tables show only analytes that were detected.

12.4.2.1 Volatile Organic Compounds. Analytical results for VOCs detected in Site 13 soils are summarized in Table 12-3 and are shown on Figures 12-6 and 12-7. VOCs were identified in all of 106 samples taken from Site 13 for VOC analysis. Detected VOCs include methylene chloride, acetone, carbon disulfide, 1,2-dichloroethene, 2-butanone, benzene, 2-hexanone, toluene, ethylbenzene, and xylenes.

Methylene chloride was detected in 100 samples and acetone was detected in 82 samples. In 12 of the samples, methylene chloride or acetone was the only reported VOCs. Although no laboratory QC samples were available for confirmation, methylene chloride and acetone are commonly found in laboratory method blanks and may be laboratory contaminants at certain concentrations.

Toluene was detected in 91 out of 106 samples (Figure 12-7). The only boring in which toluene was not detected was BOR-14. Benzene and ethylbenzene were each detected in five and six samples, respectively, all from the 11- to 11.5-foot intervals. Total xylenes had two reported detections, also both from 11 feet bgs.

Six of the soil samples with detectable VOCs contained total VOCs at levels above 1 mg/kg. These soil samples were collected from four borings (BOR-9, BOR-15, BOR-17, and BOR-19). Five of the soil samples were collected in the saturated zone.

12.4.2.2 Semivolatile Organic Compounds. The analytical results for SVOCs in soils at Site 13 are summarized in Table 12-4 and are shown on Figures 12-8 and 12-9. SVOCs were detected in 107 of 136 soil samples from the 27 borings at Site 13. The SVOCs detected in the soil samples include the PAH compounds, naphthalene, 2-methylnaphthalene, acenaphthene, fluorene, phenanthrene, anthracene, fluoranthene, pyrene, benzo(a)anthracene, chrysene, benzo(b)fluoranthene, benzo(k)fluoranthene, benzo(a)pyrene, indeno(1,2,3-cd)pyrene, and benzo(g,h,i)perylene (Figure 12-8). PAH compounds were detected in 59 samples. Naphthalene, which was reported in soil samples, was also reported in a laboratory blank. Thus some of the detections of naphthalene may be suspect. Several borings had a comparatively large number of PAH detected at depths within the saturated zone; these borings include BOR-8, BOR-11, BOR-12, BOR-23, BOR-26, BOR-27, and MWOR-2.

Diethylphthalate, n-nitro-di-phenylamine, pentachlorophenol, di-n-butylphthalate, butylbenzylphthalate, bis(2-ethylhexyl)phthalate, and di-n-octylphthalate are the remaining SVOCs detected (Figure 12-9). These SVOCs were detected in 98 of the 136 samples. Several of these analytes were reported in the laboratory blanks; n-nitroso-di-phenylamine, di-n-butylphthalate, and bis(2-ethylhexyl)phthalate. Five soil samples contained total SVOCs at concentrations exceeding 10 mg/kg. These soil samples were collected from four borings (BOR-9, BOR-13, BOR-17, and BOR-19). Three of the five soil samples were collected below the groundwater table. Boring BOR-19 is located near the center of the site along a storm sewerline. Boring BOR-17 is located between what appear to be storage tanks, just northeast of BOR-19. Borings BOR-9 and BOR-13 are located north and northwest, respectively, of the site of the previous investigations near HLA boring B-7.

12.4.2.3 Total Recoverable Petroleum Hydrocarbons. Table 12-5 and Figure 12-10 show the analytical results for petroleum hydrocarbon compounds detected in soil samples from Site 13. Site 13 soils were analyzed for TRPH and TPH as diesel. One-hundred-seven samples were analyzed for TRPH and only samples from BOR-14 were analyzed for TPH as diesel, a surface sample and three subsurface samples to a depth of 14 feet bgs. TRPH were detected in at least one sample from all 27 borings except BOR-6, BOR-14, BOR-20 and BOR-24. Surface samples collected from 0.5 to 2 feet bgs at each boring location were not submitted for TRPH analyses. A total of 15 soil samples contained TRPH at levels above 100 mg/kg. These soil samples were collected from seven borings (BOR-7, BOR-9, BOR-15, BOR-17, BOR-19, BOR-27, and MWOR-4). Nine of the soil samples were collected at depths below the groundwater table.

12.4.2.4 Pesticides/PCBs. Analytical result for pesticide and PCB compounds are summarized in Table 12-6 and are shown on Figure 12-11. The pesticides beta-BHC, 4,4'-DDD, 4,4'-DDE, 4,4'-DDT, heptachlor epoxide, and Toxaphene were detected in 14 samples from nine borings out of a total of 139 soil samples at Site 13. Toxaphene and heptachlor epoxide were detected in only one boring each. PCBs were not detected in Site 13 soils. Only two soil samples contained pesticide (Toxaphene) above 1 mg/kg. Both os these soil samples were collected from Boring BOR-26 at a depth below the groundwater table.

12.4.2.5 Metals. Analytical results for metals detected in Site 13 soils are summarized in Table 12-7. The metal content of 138 samples from various depths were analyzed at Site 13. Background ranges of metals in soil have been estimated for NAS Alameda based on a study conducted by the PRC team under CTO 121 Mod. 0001. Results of this study are included in the background data summary report (PRC/JMM, 1992c). The estimated background ranges of metals in soil are given in Table 3-1. Based on these background data, 20 metals were detected above the 95 percent/95 percent statistical tolerance interval of background concentrations at NAS Alameda. Lead concentrations were elevated above background in three samples; the surface samples from BOR-11 and BOR-16, and the 2.5-foot sample from BOR-26. Boring BOR-11 is located just south of the IMF area within Site 13; however, borings BOR-16 and BOR-26 are located along the east and southeast borders of Site 13. No other borings in the vicinity of the IMF area that was investigated previously for elevated lead levels had concentrations above background or typical limits.

Typical ranges of natural concentrations of various metals in soil are given in Table 3-2. Based on these ranges, copper, lead, magnesium, selenium, and zinc exceeded the typical range of these metals naturally found in soil. With the exception of magnesium, which has no extreme upper limit given, all metals were well within their extreme upper limits.

12.4.2.6 General Chemical Characteristics. The analytical results for general chemical characteristics are summarized on Table 12-8 and results for TOC and pH are shown on Figure 12-12. At Site 13, 35 soil samples from various depths were analyzed for pH and 33 soil samples from various depths were analyzed for TOC; these results are summarized in Figure 12-10. No pH values less than 6.2 were reported for Site 13; pH values in the vicinity of the IMF area were generally above 7.4. As many as 31 samples were analyzed for the following parameters: percent ash, chloride, nitrate (as N), sulfate, TKN, and total phosphorus.

12.4.3 Analytical Results - Groundwater Samples

Groundwater samples from Site 13 were collected from the five wells installed by Canonie, MWOR-1 through MWOR-5, as well as from a well previously installed by HLA, MW-1. Groundwater samples were analyzed for VOCs, SVOCs, TRPH, metals, pesticides and PCB compounds, and general chemical characteristics. Additionally, three travel blank samples were analyzed for VOCs. Table 12-1 provides a summary of analyses by sample. Tables 12-9 through 12-12 and Figures 12-13 through 12-15 summarize the analytical results for groundwater at Site 13. The travel blank samples are identified on the tables by a 200-series number. The figures and tables show only analytes that were detected.

12.4.3.1 Volatile Organic Compounds. Analytical results for VOCs in groundwater are summarized in Table 12-9 and Figure 12-13. The BTEX compounds benzene, ethylbenzene, and xylenes were detected in MW-1. Methylene chloride was the only VOC detected in wells MWOR-1, MWOR-3 and MWOR-4. Methylene chloride was also detected in one travel blank sample. No VOCs were detected in groundwater samples collected from wells MWOR-2 and MWOR-5.

12.4.3.2 Semivolatile Organic Compounds. The analytical results for SVOCs detected in groundwater at Site 13 are summarized in Table 12-10 and are shown on Figure 12-13. SVOCs were detected in only one well, MW-1 which is located on the southeast corner of building 397. The SVOCs detected were bis(2-ethylhexyl)phthalate and the PAH compounds naphthalene and 2-methylnaphthalene.

12.4.3.3 Total Recoverable Petroleum Hydrocarbons. The analytical results for petroleum hydrocarbon compounds in groundwater at Site 13 are summarized in Table 12-10 and are shown on Figure 12-13. Groundwater from Site 13 was analyzed for TRPH. TRPH was detected in MWOR-2 and MW-1, two of the six monitoring wells at Site 13.

12.4.3.4 Pesticides/PCBs. The analytical results for pesticides and PCB compounds are summarized in Table 12-10 and are shown on Figure 12-13. One compound, 4,4'-DDT, was detected in two wells, MW-1 and MWOR-1.

12.4.3.5 Metals. Analytical results for metals detected in the groundwater samples are presented in Table 12-11 and shown on Figure 12-14. Groundwater from all six monitoring wells were analyzed for metals. According to the Canonie QAPP and QA/QC plan, groundwater samples for metals were field-filtered as appropriate with a 0.45-micron filter (Canonie, 1990b). Background ranges of metals in groundwater have been estimated for NAS Alameda based on a study conducted by PRC/JMM as part of CTO 121 Mod. 0001. Results

of this study are included in the background data summary report (PRC/JMM, 1992c). The estimated background ranges of metals in groundwater are given in Table 3-3 and discussed in Section 3. Based on these background data, two of the metals, barium and potassium, which had concentrations at Site 13 that exceeded typical ranges (discussed below), were within the background ranges (95 percent/95 percent statistical tolerance intervals) estimated for NAS Alameda. Concentrations of manganese that exceeded typical levels but were below the extreme limits were also within background ranges.

Typical ranges of natural concentrations of metals in groundwater are given in Table 3-4. Based on these ranges, groundwater samples from all wells exceeded the typical ranges for most of the following metals: aluminum, arsenic, barium, chromium, cobalt, copper, iron, manganese, nickel, potassium, titanium, and vanadium. For those analytes with extreme limits given in Table 3-4, vanadium was exceeded in all six samples and manganese was exceeded in MWOR-1 and MWOR-3. Some detection limits for arsenic, cobalt, and selenium in some samples were above the typical range of those metals found in groundwater.

12.4.3.6 General Chemical Characteristics. The general chemical analyses performed on the groundwater samples from Site 13 include specific conductivity, TDS, dissolved oxygen, pH, and TOC. Results of the general chemical analyses are presented in Table 12-12 and shown on Figure 12-15.

12.5 SUMMARY AND CONCLUSIONS

The purpose of the data summary report is to provide a qualitative assessment of the Canonie data to identify whether sufficient information has been collected for the RI/FS evaluation. As discussed in Section 3, QA/QC information is not available for the data validation; therefore, the data presented in this report have not been validated under EPA CLP procedures.

12.5.1 Soils

A total of 281 surface and subsurface samples were collected by Canonie from 22 soil borings and during the drilling of 5 monitoring wells at Site 13. Boring logs indicate that artificial fill underlies the site and the Holocene Bay Mud Unit underlies the fill in 10 of the borings, primarily beneath the western portion and the southeast corner of Site 13. Merritt Sand deposits underlie the Bay Mud where it is present or the artificial fill where no Bay Mud is present. Site 13 soils were analyzed for VOCs, SVOCs, TPH as diesel, metals, pesticides and PCBs, TOC, and general chemical characteristics. VOCs, SVOCs, TRPH, and pesticides were detected.

VOCs were detected in soil samples collected from several depths ranging from 2.5 to 14 feet bgs in the 27 borings. Methylene chloride and acetone, two common laboratory contaminants, were detected at low concentrations in all borings. Of the remaining VOCs detected, toluene followed by other BTEX compounds were the most prevalent. Only six soil samples collected from BOR-9, BOR-15, BOR-17, and BOR-19 contained VOCs at total VOC concentrations above the preliminary comparison level of total VOC concentrations of 1 mg/kg. These borings surround the east and south sides of the IMF, where previous studies were focused. The concentrations above the 1 mg/kg level were detected in five soil samples from the saturated zone except at BOR-15 which had the highest concentration collected from that boring at 2 feet bgs.

SVOCs, consisting of phthalates and PAH, were detected most of the soil samples. Five soil samples collected from borings BOR-9, BOR-13, BOR-17, and BOR-19 contained total SVOC concentrations above the preliminary comparison level of total SVOC concentrations of 10 mg/kg. Three of the soil samples within the saturated zone are from borings BOR-17 and BOR-19.

TRPH was detected in 46 of 107 soil samples analyzed for TRPH. Fifteen soil samples collected from borings BOR-7, BOR-9, BOR-15, BOR-17, BOR-19, BOR-27, and MWOR-4 contained TRPH concentrations above the 100 mg/kg preliminary comparison level of TRPH established in Section 3.2. Six of the 15 samples were collected at depths 2 to 2.5 feet bgs.

Pesticides were detected in 14 soil samples. Only two soil samples collected from boring BOR-26 contained one pesticide (Toxaphene) at levels above 1 mg/kg. No PCBs were detected in the soil samples analyzed.

Twenty metals are present in the soil samples at concentrations exceeding the 95 percent/95 percent statistical tolerance interval of background concentrations at NAS Alameda (PRC/JMM, 1992c). However, all metals analyzed were within the range of concentrations typically found in soils, with the exception of copper, lead, magnesium, selenium, and zinc in some samples. Several samples had a particularly high number of metals with elevated concentrations: the 1.0- to 1.5-foot and 8.5- to 9.0-foot sample from MWOR-5, the 0.5- to 1.0-foot sample from BOR-16, the 11.5- to 12.0-foot sample from BOR-22, the 13.0- to 13.5-foot sample from BOR-27, and the 0.5- to 1.0-foot sample from BOR-15. The significance of the presence of metals above background levels will be further evaluated during the risk assessment to be performed during the comprehensive RI/FS process.

If the analytical results can be validated and are considered to be acceptable, the following conclusions can be made:

- Concentrations of VOCs, SVOCs, and TRPH in soil samples that exceed the preliminary corresponding comparison levels are primarily found within localized areas in the vicinity of borings BOR-9, BOR-15, BOR-17, and BOR-19. With the exception of TRPH and BTEX, it is believed that sufficient data have been collected for the RI/FS evaluation at this site. Additional data are necessary to further evaluate the extent of TRPH in this area and near the IMF where previous investigations indicated elevated concentrations of TRPH.

- Soil in the saturated zone at boring BOR-26 appears to contain pesticides (Toxaphene) in excess of 1 mg/kg at 6 and 10.5 feet bgs. Additional data is needed to evaluate the extent of pesticides in soil near boring BOR-26. Elsewhere at the site, sufficient data have been collected to evaluate the extent of pesticides and PCBs.

- Sufficient soil metals data have been collected for the RI/FS evaluation.

The significance of the presence of these VOCs, SVOCs, TRPH, and metals will be further evaluated during the risk assessment to be performed during the comprehensive RI/FS work.

12.5.2 Groundwater

Five monitoring wells were installed by Canonie at Site 13. Based on water level measurements taken in November 1990, groundwater flow is generally to the southwest with a gradient of about 0.003 foot/foot. Groundwater samples collected from the site in November 1990 contained TDS ranging from 620 mg/L to 3,160 mg/L. Groundwater samples were taken from each well and analyzed for VOCs, SVOCs, TRPH, metals, pesticides and PCBs, and general chemical characteristics.

Low levels of methylene chloride were the only VOC detected in 3 of the monitoring wells as well as in a travel blank. However, elevated concentrations of BTEX compounds were detected in MW-1, located at a former oil storage area (Figure 12-13). No other VOCs were detected in the groundwater samples. Detections of SVOCs were similar with a phthalate and PAH compounds detected only in MW-1. TRPH was detected in MW-1 and MWOR-2. MWOR-2 is the westernmost monitoring well located southwest of the former oil refinery area. One pesticide compound was also detected in groundwater samples from MW-1 and MWOR-1.

Fourteen metals are present in the groundwater at concentrations exceeding the 95 percent/95 percent statistical tolerance interval of background concentrations at NAS Alameda (PRC/JMM, 1992c). However, four of these metals have an extreme upper concentration that can be found in typical groundwater samples; with the exception of manganese and vanadium, the concentrations at Site 13 are within those extreme upper limits (Table 3-4). The concentrations of zinc, beryllium, and lead in the groundwater samples exceed the background limit but do not exceed the typical concentration limit. The four monitoring wells are similar in the number of metals with elevated concentrations.

If the analytical results can be validated and are considered to be acceptable, the following conclusions can be made:

- Groundwater in the vicinity of borings BOR-9, BOR-15, BOR-17, and BOR-19 may have been impacted by VOCs, SVOCs, pesticides, and TRPH. Additional groundwater monitoring will be required to collect data for evaluating the potential risk of the presence of these chemicals in groundwater, as well as the seasonal variations of the groundwater quality.

- Metals are present in the groundwater at concentrations exceeding the 95 percent/95 percent statistical tolerance level. Additional data are required to characterize the groundwater quality and to understand the seasonal variations of the groundwater quality at this site.

- Additional TDS data are required to evaluate whether groundwater beneath the site is considered potential drinking water.

- At present, no information is available to evaluate the tidal influence on the groundwater and the deeper groundwater-bearing zone. Additional work is required to evaluate the tidal influence and the deeper groundwater-bearing zone.

- No groundwater monitoring wells are installed in areas near borings BOR-17 and BOR-19. Additional groundwater wells should be installed at these areas to evaluate the levels of TRPH and BTEX in groundwater beneath this area.

- No information is available on the groundwater quality and gradient along the northeastern site boundary. Additional groundwater wells should be installed along the eastern site boundary to evaluate whether the groundwater is flowing eastward into the residential neighborhood.

The significance of the presence of these VOCs, SVOCs, TRPH, and metals in groundwater will be further evaluated during the risk assessment to be performed during the comprehensive RI/FS work.

TABLE 12-1

SITE 13 - FORMER OIL REFINERY
SUMMARY OF LABORATORY ANALYSES PERFORMED ON SOIL AND GROUNDWATER SAMPLES
(Sheet 1 of 11)

Boring	Depth	Matrix	Alkalinity/Acidity	Ammonia	Ammonium	Asbestos (Tot)	Ash (Tot)	SVOC	BTU Value	Cations/Anions	CEC	Cyanide (Tot)	DO (Tot)	EDB	Herb Uniq	Herbicides	Mercury	Metals	Pest/PCB	pH	Phosphorous	Potassium	Radiation	Spec. Con.	Kjeldahl Nitrogen	TOC	TPH as Diesel	TRPH	TS/TDS	VOC
BOR-10	0.5-1.0	Soil					•										•	•												
BOR-10	1.0-1.5	Soil			•		•	•												•				•	•					
BOR-10	3.5-4.0	Soil					•																				•			•
BOR-10	4.0-4.5	Soil															•	•	•											
BOR-10	7.0-7.5	Soil					•																				•			•
BOR-10	8.0-8.5	Soil															•	•												
BOR-10	11.0-11.5	Soil					•																				•			•
BOR-10	11.5-12.0	Soil															•	•												
BOR-10	14.0-14.5	Soil					•																				•			•
BOR-10	14.5-15.0	Soil															•	•												
BOR-11	0.5-1.0	Soil					•										•	•												
BOR-11	2.5-3.0	Soil					•																				•			•
BOR-11	3.5-4.0	Soil															•	•	•											
BOR-11	4.0-4.5	Soil			•		•	•												•				•	•					
BOR-11	6.5-7.0	Soil					•																				•			•
BOR-11	7.0-7.5	Soil															•	•												
BOR-11	11.0-11.5	Soil					•																				•			•
BOR-11	11.5-12.0	Soil															•	•												
BOR-11	14.0-14.5	Soil					•																				•			•
BOR-11	14.5-15.0	Soil															•	•												
BOR-12	0.5-1.0	Soil					•										•	•												
BOR-12	3.5-4.0	Soil					•																				•			•
BOR-12	4.0-4.5	Soil															•	•	•											
BOR-12	8.0-8.5	Soil			•		•	•												•				•	•					
BOR-12	8.5-9.0	Soil					•																				•			•
BOR-12	10.0-10.5	Soil															•	•												
BOR-12	11.0-11.5	Soil					•																				•			•
BOR-12	11.5-12.0	Soil															•	•												

TABLE 12-1

SITE 13 - FORMER OIL REFINERY
SUMMARY OF LABORATORY ANALYSES PERFORMED ON SOIL AND GROUNDWATER SAMPLES
(Sheet 2 of 11)

Boring	Depth	Matrix	Alkalinity/Acidity	Ammonia	Ammonium	Asbestos (Tot)	Ash (Tot)	SVOC	BTU Value	Cations/Anions	CEC	Cyanide (Tot)	DO (Tot)	EDB	Herb Uniq	Herbicides	Mercury	Metals	Pest/PCB	pH	Phosphorous	Potassium	Radiation	Spec. Con.	Kjeldahl Nitrogen	TOC	TPH as Diesel	TRPH	TS/TDS	VOC
BOR-12	14.0-14.5	Soil					•										•	•									•		•	
BOR-12	14.5-15.0	Soil															•	•												
BOR-13	0.5-1.0	Soil					•										•	•												
BOR-13	1.0-1.5	Soil			•		•		•											•				•	•					
BOR-13	2.0-2.5	Soil					•																				•		•	
BOR-13	2.5-3.0	Soil															•	•	•											
BOR-13	6.5-7.0	Soil					•																				•		•	
BOR-13	7.0-7.5	Soil															•	•												
BOR-13	11.0-11.5	Soil					•																				•		•	
BOR-13	11.5-12.0	Soil															•	•												
BOR-13	14.0-14.5	Soil					•																				•		•	
BOR-13	14.5-15.0	Soil															•	•												
BOR-14	0.0-0.5	Soil					•										•	•	•							•				
BOR-14	0.5-1.0	Soil																						•						
BOR-14	1.0-1.5	Soil		•			•		•															•						
BOR-14	4.0-4.5	Soil					•										•	•	•							•				
BOR-14	4.5-5.0	Soil		•			•		•															•	•					
BOR-14	6.0-6.5	Soil																											•	
BOR-14	8.0-8.5	Soil																											•	
BOR-14	8.5-9.0	Soil					•										•	•	•							•				
BOR-14	9.0-9.5	Soil		•			•		•															•	•					
BOR-14	13.0-13.5	Soil																											•	
BOR-14	14.0-14.5	Soil					•										•	•	•							•				
BOR-14	14.5-15.0	Soil		•			•		•															•	•					
BOR-15	0.5-1.0	Soil					•										•	•												
BOR-15	2.0-2.5	Soil					•																				•		•	
BOR-15	2.5-3.0	Soil															•	•	•											
BOR-15	4.0-4.5	Soil			•		•		•											•				•	•					

TABLE 12-1

SITE 13 - FORMER OIL REFINERY
SUMMARY OF LABORATORY ANALYSES PERFORMED ON SOIL AND GROUNDWATER SAMPLES
(Sheet 3 of 11)

Boring	Depth	Matrix	Alkalinity/Acidity	Ammonia	Ammonium	Asbestos (Tot)	Ash (Tot)	SVOC	BTU Value	Cations/Anions	CEC	Cyanide (Tot)	DO (Tot)	EDB	Herb Uniq	Herbicides	Mercury	Metals	Pest/PCB	pH	Phosphorous	Potassium	Radiation	Spec. Con.	Kjeldahl Nitrogen	TOC	TPH as Diesel	TRPH	TS/TDS	VOC
BOR-15	6.5-7.0	Soil					•										•	•									•		•	
BOR-15	7.0-7.5	Soil															•	•												
BOR-15	11.0-11.5	Soil					•																				•		•	
BOR-15	11.5-12.0	Soil															•	•												
BOR-15	14.0-14.5	Soil					•																				•		•	
BOR-15	14.5-15.0	Soil															•	•												
BOR-16	0.5-1.0	Soil					•										•	•												
BOR-16	2.0-2.5	Soil					•																				•		•	
BOR-16	2.5-3.0	Soil															•	•	•											
BOR-16	3.5-4.0	Soil		•		•		•												•				•	•					
BOR-16	6.5-7.0	Soil					•																				•		•	
BOR-16	7.0-7.5	Soil															•	•												
BOR-16	11.0-11.5	Soil					•																				•		•	
BOR-16	11.5-12.0	Soil															•	•												
BOR-16	14.0-14.5	Soil					•																				•		•	
BOR-16	14.5-15.0	Soil															•	•												
BOR-17	2.0-2.5	Soil					•										•	•												
BOR-17	2.5-3.0	Soil					•																				•		•	
BOR-17	4.0-4.5	Soil															•	•	•											
BOR-17	5.0-5.5	Soil		•		•		•												•				•	•					
BOR-17	7.0-7.5	Soil					•																				•		•	
BOR-17	8.0-8.5	Soil															•	•												
BOR-17	10.0-10.5	Soil					•																				•		•	
BOR-17	11.0-11.5	Soil															•	•												
BOR-17	11.5-12.0	Soil					•																				•		•	
BOR-17	14.5-15.0	Soil															•	•												
BOR-17R	10.5-11.0	Soil					•										•	•									•			
BOR-18	0.5-1.0	Soil					•										•	•												

TABLE 12-1

SITE 13 - FORMER OIL REFINERY
SUMMARY OF LABORATORY ANALYSES PERFORMED ON SOIL AND GROUNDWATER SAMPLES
(Sheet 4 of 11)

Boring	Depth	Matrix	Alkalinity/Acidity	Ammonia	Ammonium	Asbestos (Tot)	Ash (Tot)	SVOC	BTU Value	Cations/Anions	CEC	Cyanide (Tot)	DO (Tot)	EDB	Herb Uniq	Herbicides	Mercury	Metals	Pest/PCB	pH	Phosphorous	Potassium	Radiation	Spec. Con.	Kjeldahl Nitrogen	TOC	TPH as Diesel	TRPH	TS/TDS	VOC
BOR-18	2.5-3.0	Soil			•		•	•												•				•	•					
BOR-18	3.5-4.0	Soil					•																				•		•	
BOR-18	4.0-4.5	Soil															•	•	•											
BOR-18	7.0-7.5	Soil					•																				•		•	
BOR-18	7.5-8.0	Soil															•	•												
BOR-18	11.0-11.5	Soil					•																				•		•	
BOR-18	11.5-12.0	Soil															•	•												
BOR-18	14.0-14.5	Soil					•																				•		•	
BOR-18	14.5-15.0	Soil																												
BOR-19	0.5-1.0	Soil					•										•	•												
BOR-19	2.5-3.0	Soil					•										•	•												
BOR-19	3.5-4.0	Soil																									•		•	
BOR-19	4.0-4.5	Soil			•		•		•								•	•	•											
BOR-19	7.0-7.5	Soil					•													•				•	•					
BOR-19	8.0-8.5	Soil															•	•									•		•	
BOR-19	11.0-11.5	Soil																									•		•	
BOR-19	11.5-12.0	Soil															•	•												
BOR-19	14.0-14.5	Soil					•																				•		•	
BOR-19	14.5-15.0	Soil															•	•												
BOR-19R	7.5-8.0	Soil																•												
BOR-20	2.5-3.0	Soil					•										•	•												
BOR-20	3.0-3.5	Soil					•																				•		•	
BOR-20	4.5-5.0	Soil			•		•		•											•				•	•					
BOR-20	5.0-5.5	Soil															•	•	•											
BOR-20	6.0-6.5	Soil					•																				•		•	
BOR-20	7.0-7.5	Soil															•	•												
BOR-20	10.0-10.5	Soil					•																				•		•	
BOR-20	10.5-11.0	Soil																•												

TABLE 12-1

SITE 13 - FORMER OIL REFINERY
SUMMARY OF LABORATORY ANALYSES PERFORMED ON SOIL AND GROUNDWATER SAMPLES
(Sheet 5 of 11)

Boring	Depth	Matrix	Alkalinity/Acidity	Ammonia	Ammonium	Asbestos (Tot)	Ash (Tot)	SVOC	BTU Value	Cations/Anions	CEC	Cyanide (Tot)	DO (Tot)	EDB	Herb Uniq	Herbicides	Mercury	Metals	Pest/PCB	pH	Phosphorous	Potassium	Radiation	Spec. Con.	Kjeldahl Nitrogen	TOC	TPH as Diesel	TRPH	TS/TDS	VOC
BOR-20	11.5-12.0	Soil					•										•												•	
BOR-20	14.5-15.0	Soil															•	•												
BOR-20R	5.5-6.0	Soil					•										•	•	•								•			
BOR-21	0.5-1.0	Soil					•										•	•												
BOR-21	2.5-3.0	Soil					•																				•		•	
BOR-21	3.0-3.5	Soil															•	•	•											
BOR-21	4.0-4.5	Soil			•		•		•											•				•	•					
BOR-21	7.0-7.5	Soil					•																				•		•	
BOR-21	7.5-8.0	Soil															•	•												
BOR-21	11.5-12.0	Soil					•																				•		•	
BOR-21	12.0-12.5	Soil															•	•												
BOR-21	14.0-14.5	Soil					•																				•		•	
BOR-21	15.0-15.5	Soil															•	•												
BOR-22	0.5-1.0	Soil					•										•	•												
BOR-22	2.5-3.0	Soil					•																				•		•	
BOR-22	3.5-4.0	Soil															•	•	•											
BOR-22	4.0-4.5	Soil			•		•		•											•				•	•					
BOR-22	7.5-8.0	Soil					•																				•		•	
BOR-22	8.0-8.5	Soil															•	•												
BOR-22	11.0-11.5	Soil					•																				•		•	
BOR-22	11.5-12.0	Soil															•	•												
BOR-22	14.0-14.5	Soil					•																				•		•	
BOR-22	14.5-15.0	Soil															•	•												
BOR-23	1.0-1.5	Soil					•										•	•												
BOR-23	3.0-3.5	Soil					•																				•		•	
BOR-23	3.5-4.0	Soil															•	•	•											
BOR-23	4.0-4.5	Soil			•		•		•											•				•	•					
BOR-23	8.5-9.0	Soil					•																				•		•	

TABLE 12-1

SITE 13 - FORMER OIL REFINERY
SUMMARY OF LABORATORY ANALYSES PERFORMED ON SOIL AND GROUNDWATER SAMPLES
(Sheet 6 of 11)

Boring	Depth	Matrix	Alkalinity/Acidity	Ammonia	Ammonium	Asbestos (Tot)	Ash (Tot)	SVOC	BTU Value	Cations/Anions	CEC	Cyanide (Tot)	DO (Tot)	EDB	Herb Uniq	Herbicides	Mercury	Metals	Pest/PCB	pH	Phosphorous	Potassium	Radiation	Spec. Con.	Kjeldahl Nitrogen	TOC	TPH as Diesel	TRPH	TS/TDS	VOC
BOR-23	9.0-9.5	Soil															•	•												
BOR-23	11.0-11.5	Soil					•																				•		•	
BOR-23	11.5-12.0	Soil															•	•												
BOR-23	14.5-15.0	Soil					•																				•		•	
BOR-23	15.0-15.5	Soil															•	•												
BOR-24	1.0-1.5	Soil					•										•	•												
BOR-24	2.5-3.0	Soil					•																				•		•	
BOR-24	3.0-3.5	Soil															•	•	•											
BOR-24	4.0-4.5	Soil			•		•		•											•				•	•					
BOR-24	7.0-7.5	Soil					•																				•		•	
BOR-24	7.5-8.0	Soil															•	•												
BOR-24	11.0-11.5	Soil					•																				•		•	
BOR-24	11.5-12.0	Soil															•	•												
BOR-24	14.0-14.5	Soil					•																				•		•	
BOR-24	14.5-15.0	Soil															•	•												
BOR-25	0.5-1.0	Soil					•										•	•												
BOR-25	2.5-3.0	Soil					•																				•		•	
BOR-25	3.5-4.0	Soil															•	•	•											
BOR-25	4.0-4.5	Soil			•		•		•											•				•	•					
BOR-25	6.5-7.0	Soil					•																				•		•	
BOR-25	7.0-7.5	Soil															•	•												
BOR-25	11.0-11.5	Soil					•																				•		•	
BOR-25	11.5-12.0	Soil															•	•												
BOR-25	14.0-14.5	Soil					•																				•		•	
BOR-25	14.5-15.0	Soil															•	•												
BOR-26	1.0-1.5	Soil					•										•	•	•											
BOR-26	1.5-2.0	Soil																									•			
BOR-26	2.5-3.0	Soil															•	•	•											

TABLE 12-1

SITE 13 - FORMER OIL REFINERY
SUMMARY OF LABORATORY ANALYSES PERFORMED ON SOIL AND GROUNDWATER SAMPLES
(Sheet 7 of 11)

Boring	Depth	Matrix	Alkalinity/Acidity	Ammonia	Ammonium	Asbestos (Tot)	Ash (Tot)	SVOC	BTU Value	Cations/Anions	CEC	Cyanide (Tot)	DO (Tot)	EDB	Herb Uniq	Herbicides	Mercury	Metals	Pest/PCB	pH	Phosphorous	Potassium	Radiation	Spec. Con.	Kjeldahl Nitrogen	TOC	TPH as Diesel	TRPH	TS/TDS	VOC
BOR-26	4.0-4.5	Soil			•		•	•												•				•	•					
BOR-26	5.5-6.0	Soil						•																			•			•
BOR-26	6.0-6.5	Soil															•	•												
BOR-26	10.0-10.5	Soil						•																			•			•
BOR-26	10.5-11.0	Soil															•	•												
BOR-26	13.0-13.5	Soil						•																			•			•
BOR-26	13.5-14.0	Soil															•	•												
BOR-27	1.0-1.5	Soil						•									•	•	•											
BOR-27	2.5-3.0	Soil						•																						
BOR-27	3.0-3.5	Soil																									•			•
BOR-27	4.0-4.5	Soil			•		•	•									•	•	•											
BOR-27	7.0-7.5	Soil						•												•				•	•					
BOR-27	7.5-8.0	Soil															•	•									•			•
BOR-27	10.0-10.5	Soil						•																						
BOR-27	10.5-11.0	Soil															•	•									•			•
BOR-27	12.5-13.0	Soil						•																						
BOR-27	13.0-13.5	Soil															•	•									•			•
BOR-6	0.5-1.0	Soil						•									•	•	•											
BOR-6	2.0-2.5	Soil			•		•		•															•	•					
BOR-6	5.5-6.0	Soil						•																						•
BOR-6	6.0-6.5	Soil															•	•									•			
BOR-6	8.0-8.5	Soil						•																						•
BOR-6	8.5-9.0	Soil															•	•									•			
BOR-6	11.0-11.5	Soil						•																						•
BOR-6	11.5-12.0	Soil															•	•	•								•			
BOR-6	14.0-14.5	Soil						•																						•
BOR-6	14.5-15.0	Soil															•	•									•			
BOR-7	0.5-1.0	Soil						•									•	•												

TABLE 12-1

SITE 13 - FORMER OIL REFINERY
SUMMARY OF LABORATORY ANALYSES PERFORMED ON SOIL AND GROUNDWATER SAMPLES
(Sheet 8 of 11)

Boring	Depth	Matrix	Alkalinity/Acidity	Ammonia	Ammonium	Asbestos (Tot)	Ash (Tot)	SVOC	BTU Value	Cations/Anions	CEC	Cyanide (Tot)	DO (Tot)	EDB	Herb Uniq	Herbicides	Mercury	Metals	Pest/PCB	pH	Phosphorous	Potassium	Radiation	Spec. Con.	Kjeldahl Nitrogen	TOC	TPH as Diesel	TRPH	TS/TDS	VOC
BOR-7	2.0-2.5	Soil															•	•	•								•			
BOR-7	2.5-3.0	Soil					•																							•
BOR-7	3.5-4.0	Soil															•	•									•			
BOR-7	4.0-4.5	Soil					•																							•
BOR-7	6.0-6.5	Soil		•		•		•																•	•					
BOR-7	8.5-9.0	Soil					•																							•
BOR-7	9.0-9.5	Soil															•	•									•			
BOR-7	13.5-14.0	Soil					•																							•
BOR-7	14.5-15.0	Soil															•	•									•			
BOR-8	1.0-1.5	Soil					•										•	•												
BOR-8	2.5-3.0	Soil		•		•		•												•				•	•					
BOR-8	3.0-3.5	Soil		•		•		•												•				•	•					
BOR-8	3.5-4.0	Soil															•	•	•											
BOR-8	4.0-4.5	Soil					•																							•
BOR-8	6.5-7.0	Soil															•	•												
BOR-8	7.0-7.5	Soil					•																							•
BOR-8	10.5-11.0	Soil															•	•												
BOR-8	11.0-11.5	Soil					•																							•
BOR-8	12.5-13.0	Soil															•	•												
BOR-8	14.0-14.5	Soil					•																							•
BOR-9	0.5-1.0	Soil					•										•	•												
BOR-9	2.0-2.5	Soil					•																							•
BOR-9	2.5-3.0	Soil															•	•	•											
BOR-9	4.0-4.5	Soil		•		•		•												•				•	•					
BOR-9	6.5-7.0	Soil					•																							•
BOR-9	7.0-7.5	Soil															•	•												
BOR-9	11.0-11.5	Soil					•																							•
BOR-9	11.5-12.0	Soil															•	•												

TABLE 12-1

SITE 13 - FORMER OIL REFINERY
SUMMARY OF LABORATORY ANALYSES PERFORMED ON SOIL AND GROUNDWATER SAMPLES
(Sheet 9 of 11)

Boring	Depth	Matrix	Alkalinity/Acidity	Ammonia	Ammonium	Asbestos (Tot)	Ash (Tot)	SVOC	BTU Value	Cations/Anions	CEC	Cyanide (Tot)	DO (Tot)	EDB	Herb Uniq	Herbicides	Mercury	Metals	Pest/PCB	pH	Phosphorous	Potassium	Radiation	Spec. Con.	Kjeldahl Nitrogen	TOC	TPH as Diesel	TRPH	TS/TDS	VOC
BOR-9	14.0-14.5	Soil					•																				•		•	
BOR-9	14.5-15.0	Soil															•	•												
MWOR-1	0.5-1.0	Soil																							•					
MWOR-1	1.0-1.5	Soil					•										•	•												
MWOR-1	2.5-3.0	Soil					•																				•		•	
MWOR-1	3.0-3.5	Soil															•	•	•											
MWOR-1	4.0-4.5	Soil		•		•		•												•				•	•					
MWOR-1	4.5-5.0	Soil																							•					
MWOR-1	7.0-7.5	Soil					•																				•		•	
MWOR-1	7.5-8.0	Soil															•	•												
MWOR-1	9.0-9.5	Soil																												
MWOR-1	11.5-12.0	Soil					•																				•		•	
MWOR-1	12.0-12.5	Soil															•	•												
MWOR-1	14.5-15.0	Soil					•																				•		•	
MWOR-1	15.0-15.5	Soil															•	•												
MWOR-2	2.0-2.5	Soil					•										•	•												
MWOR-2	2.5-3.0	Soil					•																				•		•	
MWOR-2	4.0-4.5	Soil															•	•	•											
MWOR-2	5.0-5.5	Soil		•		•		•												•				•	•					
MWOR-2	7.0-7.5	Soil					•																				•		•	
MWOR-2	8.0-8.5	Soil															•	•												
MWOR-2	10.0-10.5	Soil					•																				•		•	
MWOR-2	11.0-11.5	Soil															•	•												
MWOR-2	12.0-12.5	Soil					•																				•		•	
MWOR-2	13.0-13.5	Soil															•	•												
MWOR-2R	12.5-13.0	Soil					•										•	•									•			
MWOR-3	2.0-2.5	Soil					•										•	•												
MWOR-3	2.5-3.0	Soil					•																				•		•	

TABLE . . 1

SITE 13 - FORMER OIL REFINERY
SUMMARY OF LABORATORY ANALYSES PERFORMED ON SOIL AND GROUNDWATER SAMPLES
(Sheet 10 of 11)

Boring	Depth	Matrix	Alkalinity/Acidity	Ammonia	Ammonium	Asbestos (Tot)	Ash (Tot)	SVOC	BTU Value	Cations/Anions	CEC	Cyanide (Tot)	DO (Tot)	EDB	Herb Uniq	Herbicides	Mercury	Metals	Pest/PCB	pH	Phosphorous	Potassium	Radiation	Spec. Con.	Kjeldahl Nitrogen	TOC	TPH as Diesel	TRPH	TS/TDS	VOC
MWOR-3	4.0-4.5	Soil															•	•	•											
MWOR-3	5.0-5.5	Soil			•		•		•										•	•				•	•					
MWOR-3	7.0-7.5	Soil						•																			•		•	
MWOR-3	8.0-8.5	Soil															•	•												
MWOR-3	10.0-10.5	Soil						•																			•		•	
MWOR-3	11.0-11.5	Soil															•	•												
MWOR-3	11.5-12.0	Soil						•																			•		•	
MWOR-3	13.0-13.5	Soil															•	•												
MWOR-3R	10.5-11.0	Soil						•									•	•									•			
MWOR-4	1.5-2.0	Soil						•									•	•												
MWOR-4	2.5-3.0	Soil						•																			•		•	
MWOR-4	3.0-3.5	Soil															•	•	•											
MWOR-4	4.0-4.5	Soil			•		•		•											•				•	•					
MWOR-4	6.5-7.0	Soil						•																			•		•	
MWOR-4	7.0-7.5	Soil															•	•												
MWOR-4	10.0-10.5	Soil						•																			•		•	
MWOR-4	10.5-11.0	Soil															•	•												
MWOR-4	14.0-14.5	Soil						•																			•		•	
MWOR-4	14.5-15.0	Soil															•	•												
MWOR-5	1.0-1.5	Soil						•									•	•												
MWOR-5	1.5-2.0	Soil			•		•		•											•				•	•					
MWOR-5	7.0-7.5	Soil						•																			•		•	
MWOR-5	8.5-9.0	Soil															•	•	•											
MWOR-5	10.0-10.5	Soil						•																			•		•	
MWOR-5	10.5-11.0	Soil															•	•												
MWOR-5	12.5-13.0	Soil						•																			•		•	
MWOR-5	13.0-13.5	Soil															•	•												
MWOR-5	14.5-15.0	Soil						•																			•		•	

TABLE 12-1

SITE 13 - FORMER OIL REFINERY
SUMMARY OF LABORATORY ANALYSES PERFORMED ON SOIL AND GROUNDWATER SAMPLES
(Sheet 11 of 11)

Boring	Depth	Matrix	Alkalinity/Acidity	Ammonia	Ammonium	Asbestos (Tot)	Ash (Tot)	SVOC	BTU Value	Cations/Anions	CEC	Cyanide (Tot)	DO (Tot)	EDB	Herb Uniq	Herbicides	Mercury	Metals	Pest/PCB	pH	Phosphorous	Potassium	Radiation	Spec. Con.	Kjeldahl Nitrogen	TOC	TPH as Diesel	TRPH	TS/TDS	VOC
MWOR-5	15.0-15.5	Soil															•	•												
Summary Soil				4	27		31	136	31								138	139	35	25				31	33	4	107		106	
219	0.0	Water																												•
220	0.0	Water																												•
250	0.0	Water																												•
MW1	0.0	Water						•				•					•	•	•				•		•		•	•		•
MWOR-1	0.0	Water						•				•					•	•	•				•		•		•	•		•
MWOR-2	0.0	Water						•				•					•	•	•				•		•		•	•		•
MWOR-3	0.0	Water						•				•					•	•	•				•		•		•	•		•
MWOR-4	0.0	Water						•				•					•	•	•				•		•		•	•		•
MWOR-5	0.0	Water						•				•					•	•	•				•		•		•	•		•
Summary Water								6				6					6	6	6				6		6		6	6		9

Notes:

200-series boring numbers indicate travel blanks

Analysis	Methods	Matrix
Ash	EPA SM302H	soil
BTU	ASTM D3286-73	soil
TRPH	EPA 418.1	soil
TPH as Diesel	LUFT	soil
TOC	EPA 29-3.52	soil
TOC	EPA 415.2	water
TOC	EPA/CE81-1	soil
Misc		
TKN	AOAC 2.05	soil
TKN	ASA #9 31-3	soil
Ammonia	AOAC 2.06	soil

Analysis	Methods	Matrix
Misc (cont.)		
Ammonium	EPA/CE81-1	soil
Phosphorus	ASA #9 24-2.3	soil
Nitrate	EPA 300.0	soil
Chloride	EPA 300.0 (Mod)	soil
BTU	ASTM D3286-73	soil
DO	DO	water
Spec Con	EPA 120.1	water
TDS	EPA 160.1	water
Metals	EPA 200.7	water
Metals	EPA 6010	soil

Analysis	Methods	Matrix
Pest PCB	EPA 608	water
Pest PCB	EPA 8080	soil
VOC	EPA 624	water
VOC	EPA 8240	soil
SVOC	EPA 8270	soil
pH	EPA 9045	water

TABLE 12-2

SITE 13 - FORMER OIL REFINERY
GEOTECHNICAL SAMPLE LABORATORY TEST RESULTS
(Sheet 1 of 2)

Sample No.	Depth (ft)	Soil Classification Laboratory	Soil Classification Field	Moisture Content (%)	Dry Density (pcf)	Specific Gravity	Hydraulic Conductivity (cm/s)
MWOR-1	5	NA	SM	9.7	115.9	NA	NA
MWOR-1	5.5	NA	SM	13.3	112.4	NA	NA
MWOR-1	8.5	NA	SC	17.1	112.6	NA	NA
MWOR-1	10.5	SM	SC	17.5	110.1	NA	2.00E-07
MWOR-3	0.5	NA	SM	4.3	99.7	NA	NA
MWOR-4	1	GP	GM	NA	NA	NA	NA
BOR-6	1	NA	SM	3.5	94.8	NA	NA
BOR-7	1	NA	SM	2.3	99.7	NA	NA
BOR-7	10.5	SM	CL	NA	NA	NA	NA
BOR-8	0.5	NA	SM	NA	NA	NA	NA
BOR-8	5	NA	SM	18.9	96.1	NA	NA
BOR-10	2	SP	SM	7.2	98.9	NA	3.00E-03
BOR-10	5	NA	SM	14.6	104.0	NA	NA
BOR-10	12	NA	CL/SC	21.5	100.3	NA	NA
BOR-11	10.5	CH	CL/SM	NA	NA	NA	NA
BOR-12	1	SP	SM	NA	NA	2.71	NA
BOR-12	9.5	SP	SM/CL	31.5	86.9	NA	NA
BOR-12	10.5	NA	CL	17.1	107.9	NA	NA
BOR-13	8	NA	CL	NA	NA	2.62	NA
BOR-13	9.5	CH	CL	NA	NA	2.51	NA
BOR-15	5.5	SP	SM	NA	NA	2.65	NA
BOR-16	10.5	SM	SC	NA	NA	NA	NA
BOR-16	12.5	NA	SC	14.1	115.5	NA	NA
BOR-18	9	NA	SC	21.7	103.8	NA	NA
BOR-18	10.5	SM	SC	18.0	109.1	2.63	2.00E-08
BOR-19	5	SM	SC	NA	NA	2.63	NA
BOR-20	1	SP	GP/SM	NA	NA	NA	NA
BOR-20	15	SM	SM	NA	NA	NA	NA
BOR-21	13	SM	SM	NA	NA	2.64	NA
BOR-22	8.5	NA	SM	17.1	105.5	NA	NA
BOR-22	12	SM	SM	NA	NA	NA	NA
BOR-23	1.5	SP	SM	4.4	101.5	2.73	1.00E-03
BOR-23	10	SP/SM	SM	NA	NA	NA	NA
BOR-23	14	NA	SM	18.0	110.9	NA	NA

TABLE 12-2

SITE 13 - FORMER OIL REFINERY
GEOTECHNICAL SAMPLE LABORATORY TEST RESULTS
(Sheet 2 of 2)

Sample No.	Depth (ft)	Soil Classification Laboratory	Soil Classification Field	Moisture Content (%)	Dry Density (pcf)	Specific Gravity	Hydraulic Conductivity (cm/s)
BOR-24	13	SM	SM	NA	NA	NA	NA
BOR-26	11.5	NA	SM/SC	18.7	107.3	NA	NA

Notes:
NA - Not Analyzed
Parameters not detectect are reported as less than method detection limit.

Laboratory Methods (Units):
Soil Classification - Unified Soil Classification System (USCS) - ASTM D2488
Moisture Content - ASTM D2216 (percent)
Dry Density - ASTM D2937 (pounds per cubic foot)
Specific Gravity - ASTM D854
Hydraulic Conductivity - EPA 9100 (centimeters per second)

Soil Classification Legend:

GW Well graded gravels, gravel-sand mixtures, little or no fines

GP Poorly graded gravels, gravel-sand mixtures, little or no fines

GM Silty gravels, gravel-sand-silt mixtures

GC Clayey gravels, gravel-sand-clay mixtures

SW Well graded sands, gravelly sands, little or no fines

SP Poorly-graded sands, gravelly sands, little or no fines

SM Silty sands, sand-silt mixtures

SC Clayey sands, sand-clay mixtures

ML Inorganic silts and very fine sands, rock flour, silty or clayey fine sands or clayey silts with slight plasticity

CL Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, silty clays, lean clays

OL Organic silts and organic silty clays or low plasticity

CH Inorganic clays of high plasticity, fat clays

TABLE 12-3

SITE 13 - FORMER OIL REFINERY
RESULTS FOR VOLATILE ORGANIC COMPOUNDS DETECTED IN SOIL SAMPLES
(Sheet 1 of 15)

Parameter Reported	BOR-10 07/12/90 3.5-4 ft	BOR-10 07/12/90 7-7.5 ft	BOR-10 07/12/90 11-11.5 ft	BOR-10 07/12/90 14-14.5 ft	BOR-11 07/18/90 2.5-3 ft	BOR-11 07/18/90 6.5-7 ft	BOR-11 07/18/90 11-11.5 ft
Methylene Chloride (ug/kg)	10	11	19	10	10	31	49
Acetone (ug/kg)	18	38	71	18	18	10	43
Carbon Disulfide (ug/kg)	<5.00	<6.00	14	<6.00	<5.00	<6.00	3
1,2-Dichloroethene (total) (ug/kg)	<5.00	<6.00	<9.00	<6.00	<5.00	<6.00	<9.00
2-Butanone (ug/kg)	2	3	20	2	3	<12.0	10
Benzene (ug/kg)	<5.00	<6.00	<9.00	<6.00	<5.00	<6.00	<9.00
2-Hexanone (ug/kg)	<10.0	<12.0	<18.0	<12.0	<10.0	<12.0	<19.0
Toluene (ug/kg)	4	16	110	3	38	4	100
Ethylbenzene (ug/kg)	<5.00	<6.00	<9.00	<6.00	<5.00	<6.00	<9.00
Xylenes (total) (ug/kg)	<5.00	<6.00	<9.00	<6.00	<5.00	<6.00	<9.00

Notes: NA = Not Analyzed
< = Detection Limit
ug/kg = micrograms per kilogram
Data not validated by JMM

TABLE 12-3

SITE 13 - FORMER OIL REFINERY
RESULTS FOR VOLATILE ORGANIC COMPOUNDS DETECTED IN SOIL SAMPLES
(Sheet 2 of 15)

Parameter Reported	BOR-11 07/18/90 14-14.5 ft	BOR-12 07/18/90 3.5-4 ft	BOR-12 07/18/90 8.5-9 ft	BOR-12 07/18/90 11-11.5 ft	BOR-12 07/18/90 14-14.5 ft	BOR-13 07/03/90 2-2.5 ft	BOR-13 07/03/90 6.5-7 ft
Methylene Chloride (ug/kg)	17	10	45	160	63	15	17
Acetone (ug/kg)	9	17	37	110	38	<10.0	17
Carbon Disulfide (ug/kg)	<6.00	<5.00	<6.00	13	<6.00	<5.20	<6.10
1,2-Dichloroethene (total) (ug/kg)	<6.00	<5.00	<6.00	<9.00	<6.00	<5.20	<6.10
2-Butanone (ug/kg)	<12.0	<10.0	5	21	<12.0	<10.0	<12.0
Benzene (ug/kg)	<6.00	<5.00	<6.00	<9.00	<6.00	<5.20	<6.10
2-Hexanone (ug/kg)	<12.0	<10.0	<12.0	<18.0	<12.0	<10.0	<12.0
Toluene (ug/kg)	10	16	13	230	9	21	26
Ethylbenzene (ug/kg)	<6.00	<5.00	<6.00	<9.00	<6.00	<5.20	<6.10
Xylenes (total) (ug/kg)	<6.00	<5.00	<6.00	<9.00	<6.00	<5.20	<6.10

Notes: NA = Not Analyzed
< = Detection Limit
ug/kg = micrograms per kilogram
Data not validated by JMM

TABLE 12-3

SITE 13 - FORMER OIL REFINERY
RESULTS FOR VOLATILE ORGANIC COMPOUNDS DETECTED IN SOIL SAMPLES
(Sheet 3 of 15)

Parameter Reported	BOR-13 07/03/90 11-11.5 ft	BOR-13 07/03/90 14-14.5 ft	BOR-14 05/23/90 6-6.5 ft	BOR-14 05/23/90 8-8.5 ft	BOR-14 05/23/90 13-13.5 ft	BOR-15 07/18/90 2-2.5 ft	BOR-15 07/18/90 6.5-7 ft
Methylene Chloride (ug/kg)	27	29	18	13	14	<1300	40
Acetone (ug/kg)	25	<12.0	<12.0	<12.0	<12.0	<1300	26
Carbon Disulfide (ug/kg)	<5.20	<6.00	<6.00	<6.00	<6.20	<630	<6.00
1,2-Dichloroethene (total) (ug/kg)	<5.20	<6.00	<6.00	<6.00	<6.20	<630	<6.00
2-Butanone (ug/kg)	<10.0	<12.0	<12.0	<12.0	<12.0	<1300	<12.0
Benzene (ug/kg)	<5.20	<6.00	<6.00	<6.00	<6.20	<630	<6.00
2-Hexanone (ug/kg)	<10.0	<12.0	<12.0	<12.0	<12.0	<1300	<12.0
Toluene (ug/kg)	37	29	<6.00	<6.00	<6.20	1600	13
Ethylbenzene (ug/kg)	<5.20	<6.00	<6.00	<6.00	<6.20	<630	<6.00
Xylenes (total) (ug/kg)	<5.20	<6.00	<6.00	<6.00	<6.20	<630	<6.00

Notes: NA = Not Analyzed
< = Detection Limit
ug/kg = micrograms per kilogram
Data not validated by JMM

TABLE 12-3

SITE 13 - FORMER OIL REFINERY
RESULTS FOR VOLATILE ORGANIC COMPOUNDS DETECTED IN SOIL SAMPLES
(Sheet 4 of 15)

Parameter Reported	BOR-15 07/18/90 11-11.5 ft	BOR-15 07/18/90 14-14.5 ft	BOR-16 07/23/90 2-2.5 ft	BOR-16 07/23/90 6.5-7 ft	BOR-16 07/23/90 11-11.5 ft	BOR-16 07/23/90 14-14.5 ft	BOR-17 07/17/90 2.5-3 ft
Methylene Chloride (ug/kg)	31	26	12	16	11	14	<11.0
Acetone (ug/kg)	39	28	<10.0	18	<12.0	<12.0	<22.0
Carbon Disulfide (ug/kg)	<6.00	<6.00	<5.00	<6.00	<6.00	<6.00	<11.0
1,2-Dichloroethene (total) (ug/kg)	<6.00	<6.00	<5.00	<6.00	<6.00	<6.00	<11.0
2-Butanone (ug/kg)	5	4	<10.0	<12.0	<12.0	<12.0	<22.0
Benzene (ug/kg)	2	<6.00	<5.00	<6.00	<6.00	<6.00	<11.0
2-Hexanone (ug/kg)	<13.0	<12.0	<10.0	<12.0	<12.0	<12.0	<22.0
Toluene (ug/kg)	14	5	57	15	27	12	320
Ethylbenzene (ug/kg)	10	<6.00	<5.00	<6.00	<6.00	<6.00	<11.0
Xylenes (total) (ug/kg)	27	<6.00	<5.00	<6.00	<6.00	<6.00	<11.0

Notes: NA = Not Analyzed
< = Detection Limit
ug/kg = micrograms per kilogram
Data not validated by JMM

TABLE 12-3

SITE 13 - FORMER OIL REFINERY
RESULTS FOR VOLATILE ORGANIC COMPOUNDS DETECTED IN SOIL SAMPLES
(Sheet 5 of 15)

Parameter Reported	BOR-17 07/17/90 7-7.5 ft	BOR-17 07/17/90 10-10.5 ft	BOR-17 07/17/90 11.5-12 ft	BOR-18 07/23/90 3.5-4 ft	BOR-18 07/23/90 7-7.5 ft	BOR-18 07/23/90 11-11.5 ft	BOR-18 07/23/90 14-14.5 ft
Methylene Chloride (ug/kg)	20	<5900	15	16	16	11	15
Acetone (ug/kg)	50	<5900	70	25	<13.0	<12.0	12
Carbon Disulfide (ug/kg)	<6.00	<2900	<6.00	<7.00	<7.00	<6.00	<6.00
1,2-Dichloroethene (total) (ug/kg)	<6.00	<2900	<6.00	<7.00	<7.00	<6.00	<6.00
2-Butanone (ug/kg)	7	<5900	12	<13.0	<13.0	<12.0	<12.0
Benzene (ug/kg)	<6.00	<2900	10	<7.00	<7.00	<6.00	<6.00
2-Hexanone (ug/kg)	<12.0	<5900	<12.0	<13.0	<13.0	<12.0	<12.0
Toluene (ug/kg)	15	<2900	13	62	36	26	38
Ethylbenzene (ug/kg)	<6.00	1400	5	<7.00	<7.00	<6.00	<6.00
Xylenes (total) (ug/kg)	<6.00	<2900	<6.00	<7.00	<7.00	<6.00	<6.00

Notes: NA = Not Analyzed
< = Detection Limit
ug/kg = micrograms per kilogram
Data not validated by JMM

TABLE 12-3

SITE 13 - FORMER OIL REFINERY
RESULTS FOR VOLATILE ORGANIC COMPOUNDS DETECTED IN SOIL SAMPLES
(Sheet 6 of 15)

Parameter Reported	BOR-19 07/18/90 2.5-3 ft	BOR-19 07/18/90 7-7.5 ft	BOR-19 07/18/90 11-11.5 ft	BOR-19 07/18/90 14-14.5 ft	BOR-20 07/17/90 3-3.5 ft	BOR-20 07/17/90 6-6.5 ft	BOR-20 07/17/90 10-10.5 ft
Methylene Chloride (ug/kg)	12	25	<1500	8	8	19	20
Acetone (ug/kg)	29	79	<1500	45	13	12	15
Carbon Disulfide (ug/kg)	<5.00	<6.00	<740	<6.00	<5.00	<6.00	<6.00
1,2-Dichloroethene (total) (ug/kg)	<5.00	<6.00	<740	<6.00	<5.00	<6.00	<6.00
2-Butanone (ug/kg)	<11.0	10	<1500	<12.0	2	<12.0	<12.0
Benzene (ug/kg)	<5.00	<6.00	360	<6.00	<5.00	<6.00	<6.00
2-Hexanone (ug/kg)	<11.0	<12.0	<1500	<12.0	<10.0	<12.0	2
Toluene (ug/kg)	<5.00	40	290	6	15	4	2
Ethylbenzene (ug/kg)	<5.00	<6.00	1500	<6.00	<5.00	<6.00	<6.00
Xylenes (total) (ug/kg)	<5.00	<6.00	<740	<6.00	<5.00	<6.00	<6.00

Notes: NA = Not Analyzed
< = Detection Limit
ug/kg = micrograms per kilogram
Data not validated by JMM

TABLE 12-3

SITE 13 - FORMER OIL REFINERY
RESULTS FOR VOLATILE ORGANIC COMPOUNDS DETECTED IN SOIL SAMPLES
(Sheet 7 of 15)

Parameter Reported	BOR-20 07/17/90 11.5-12 ft	BOR-21 07/18/90 2.5-3 ft	BOR-21 07/19/90 7-7.5 ft	BOR-21 07/18/90 14-14.5 ft	BOR-22 07/23/90 2.5-3 ft	BOR-22 07/23/90 7.5-8 ft	BOR-22 07/23/90 11-11.5 ft
Methylene Chloride (ug/kg)	15	5	12	18	19	14	28
Acetone (ug/kg)	13	53	35	19	<12.0	<12.0	<15.0
Carbon Disulfide (ug/kg)	2	<5.00	<6.00	<6.00	<6.00	<6.00	<7.00
1,2-Dichloroethene (total) (ug/kg)	<6.00	<5.00	<6.00	<6.00	<6.00	<6.00	<7.00
2-Butanone (ug/kg)	<12.0	<11.0	2	<12.0	<12.0	<12.0	<15.0
Benzene (ug/kg)	<6.00	<5.00	<6.00	<6.00	<6.00	<6.00	<7.00
2-Hexanone (ug/kg)	<12.0	<11.0	<12.0	<12.0	<12.0	<12.0	<15.0
Toluene (ug/kg)	2	18	1	2	17	21	140
Ethylbenzene (ug/kg)	<6.00	<5.00	<6.00	5	<6.00	<6.00	<7.00
Xylenes (total) (ug/kg)	<6.00	<5.00	<6.00	<6.00	<6.00	<6.00	<7.00

Notes: NA = Not Analyzed
< = Detection Limit
ug/kg = micrograms per kilogram
Data not validated by JMM

TABLE 12-3

SITE 13 - FORMER OIL REFINERY
RESULTS FOR VOLATILE ORGANIC COMPOUNDS DETECTED IN SOIL SAMPLES
(Sheet 8 of 15)

Parameter Reported	BOR-22 07/23/90 14-14.5 ft	BOR-23 07/20/90 3-3.5 ft	BOR-23 07/20/90 8.5-9 ft	BOR-23 07/20/90 11-11.5 ft	BOR-23 07/20/90 14.5-15 ft	BOR-24 07/18/90 2.5-3 ft	BOR-24 07/18/90 7-7.5 ft
Methylene Chloride (ug/kg)	15	7	7	22	12	14	6
Acetone (ug/kg)	<12.0	11	45	85	17	8	33
Carbon Disulfide (ug/kg)	<6.00	<5.00	<6.00	11	<6.00	<5.00	<6.00
1,2-Dichloroethene (total) (ug/kg)	<6.00	<5.00	<6.00	5	<6.00	<5.00	<6.00
2-Butanone (ug/kg)	<12.0	<11.0	4	26	<12.0	<11.0	<12.0
Benzene (ug/kg)	<6.00	<5.00	<6.00	<9.00	<6.00	<5.00	<6.00
2-Hexanone (ug/kg)	<12.0	<11.0	<12.0	<19.0	<12.0	<11.0	<12.0
Toluene (ug/kg)	6	41	12	130	10	<5.00	2
Ethylbenzene (ug/kg)	<6.00	<5.00	<6.00	<9.00	<6.00	<5.00	<6.00
Xylenes (total) (ug/kg)	<6.00	<5.00	<6.00	<9.00	<6.00	<5.00	<6.00

Notes: NA = Not Analyzed
< = Detection Limit
ug/kg = micrograms per kilogram
Data not validated by JMM

TABLE 12-3

SITE 13 - FORMER OIL REFINERY
RESULTS FOR VOLATILE ORGANIC COMPOUNDS DETECTED IN SOIL SAMPLES
(Sheet 9 of 15)

Parameter Reported	BOR-24 07/18/90 11-11.5 ft	BOR-24 07/18/90 14-14.5 ft	BOR-25 07/20/90 2.5-3 ft	BOR-25 07/20/90 6.5-7 ft	BOR-25 07/20/90 11-11.5 ft	BOR-25 07/20/90 14-14.5 ft	BOR-26 07/24/90 5.5-6 ft
Methylene Chloride (ug/kg)	7	17	14	8	9	14	5
Acetone (ug/kg)	36	11	63	38	15	24	11
Carbon Disulfide (ug/kg)	<6.00	<6.00	<5.00	<6.00	<6.00	<6.00	<6.00
1,2-Dichloroethene (total) (ug/kg)	<6.00	<6.00	<5.00	<6.00	<6.00	<6.00	<6.00
2-Butanone (ug/kg)	<12.0	<12.0	<11.0	4	5	<12.0	3
Benzene (ug/kg)	<6.00	<6.00	<5.00	<6.00	<6.00	<6.00	<6.00
2-Hexanone (ug/kg)	<12.0	<12.0	<11.0	<12.0	<12.0	<12.0	<12.0
Toluene (ug/kg)	<6.00	3	34	17	20	11	4
Ethylbenzene (ug/kg)	<6.00	<6.00	<5.00	<6.00	<6.00	<6.00	<6.00
Xylenes (total) (ug/kg)	<6.00	<6.00	<5.00	<6.00	<6.00	<6.00	<6.00

Notes: NA = Not Analyzed
< = Detection Limit
ug/kg = micrograms per kilogram
Data not validated by JMM

TABLE 12-3

SITE 13 - FORMER OIL REFINERY
RESULTS FOR VOLATILE ORGANIC COMPOUNDS DETECTED IN SOIL SAMPLES
(Sheet 10 of 15)

Parameter Reported	BOR-26 07/24/90 10-10.5 ft	BOR-26 07/24/90 13-13.5 ft	BOR-27 07/20/90 2.5-3 ft	BOR-27 07/20/90 7-7.5 ft	BOR-27 07/20/90 10-10.5 ft	BOR-27 07/20/90 12.5-13 ft	BOR-6 07/05/90 5.5-6 ft
Methylene Chloride (ug/kg)	6	5	10	13	15	32	21
Acetone (ug/kg)	27	19	18	21	32	140	6
Carbon Disulfide (ug/kg)	<6.00	<6.00	<5.00	<6.00	<6.00	4	<6.00
1,2-Dichloroethene (total) (ug/kg)	<6.00	<6.00	<5.00	<6.00	<6.00	<9.00	<6.00
2-Butanone (ug/kg)	<12.0	6	<11.0	<12.0	<12.0	15	<12.0
Benzene (ug/kg)	<6.00	<6.00	<5.00	<6.00	<6.00	<9.00	<6.00
2-Hexanone (ug/kg)	<12.0	<12.0	<11.0	<12.0	<12.0	<18.0	<12.0
Toluene (ug/kg)	<6.00	9	95	8	5	74	8
Ethylbenzene (ug/kg)	<6.00	<6.00	<5.00	<6.00	<6.00	<9.00	<6.00
Xylenes (total) (ug/kg)	<6.00	<6.00	<5.00	<6.00	<6.00	<9.00	<6.00

Notes: NA = Not Analyzed
< = Detection Limit
ug/kg = micrograms per kilogram
Data not validated by JMM

TABLE 12-3

SITE 13 - FORMER OIL REFINERY
RESULTS FOR VOLATILE ORGANIC COMPOUNDS DETECTED IN SOIL SAMPLES
(Sheet 11 of 15)

Parameter Reported	BOR-6 07/05/90 8-8.5 ft	BOR-6 07/05/90 11-11.5 ft	BOR-6 07/05/90 14-14.5 ft	BOR-7 07/05/90 2.5-3 ft	BOR-7 07/05/90 4-4.5 ft	BOR-7 07/05/90 8.5-9 ft	BOR-7 07/05/90 13.5-14 ft
Methylene Chloride (ug/kg)	19	22	11	31	12	14	14
Acetone (ug/kg)	8	7	29	7	8	6	9
Carbon Disulfide (ug/kg)	<6.00	<6.00	<6.00	<11.0	<6.00	<6.00	<6.00
1,2-Dichloroethene (total) (ug/kg)	<6.00	<6.00	<6.00	<11.0	<6.00	<6.00	<6.00
2-Butanone (ug/kg)	<12.0	<12.0	<12.0	<22.0	<12.0	<12.0	<12.0
Benzene (ug/kg)	<6.00	<6.00	<6.00	<11.0	<6.00	<6.00	<6.00
2-Hexanone (ug/kg)	<12.0	<12.0	<12.0	<22.0	<12.0	<12.0	<12.0
Toluene (ug/kg)	18	54	13	260	9	14	36
Ethylbenzene (ug/kg)	<6.00	<6.00	<6.00	<11.0	<6.00	<6.00	<6.00
Xylenes (total) (ug/kg)	<6.00	<6.00	<6.00	<11.0	<6.00	<6.00	<6.00

Notes: NA = Not Analyzed
< = Detection Limit
ug/kg = micrograms per kilogram
Data not validated by JMM

TABLE 12-3

SITE 13 - FORMER OIL REFINERY
RESULTS FOR VOLATILE ORGANIC COMPOUNDS DETECTED IN SOIL SAMPLES
(Sheet 12 of 15)

Parameter Reported	BOR-8 07/16/90 4-4.5 ft	BOR-8 07/16/90 7-7.5 ft	BOR-8 07/16/90 11-11.5 ft	BOR-8 07/16/90 14-14.5 ft	BOR-9 07/23/90 2-2.5 ft	BOR-9 07/23/90 6.5-7 ft	BOR-9 07/23/90 11-11.5 ft
Methylene Chloride (ug/kg)	15	15	11	8	14	2800	2000
Acetone (ug/kg)	23	14	21	32	<12.0	<1400	<1500
Carbon Disulfide (ug/kg)	<6.00	<6.00	<6.00	<6.00	<6.00	<720	<750
1,2-Dichloroethene (total) (ug/kg)	<6.00	<6.00	<6.00	<6.00	<6.00	<720	<750
2-Butanone (ug/kg)	<11.0	<12.0	3	3	<12.0	<1400	<1500
Benzene (ug/kg)	<6.00	<6.00	<6.00	<6.00	<6.00	1000	960
2-Hexanone (ug/kg)	<11.0	<12.0	<13.0	<11.0	<12.0	<1400	<1500
Toluene (ug/kg)	25	1	4	7	17	1300	<750
Ethylbenzene (ug/kg)	<6.00	<6.00	<6.00	<6.00	<6.00	<720	1800
Xylenes (total) (ug/kg)	<6.00	<6.00	<6.00	<6.00	<6.00	<720	4100

Notes: NA = Not Analyzed
< = Detection Limit
ug/kg = micrograms per kilogram
Data not validated by JMM

TABLE 12-3

SITE 13 - FORMER OIL REFINERY
RESULTS FOR VOLATILE ORGANIC COMPOUNDS DETECTED IN SOIL SAMPLES
(Sheet 13 of 15)

Parameter Reported	BOR-9 07/23/90 14-14.5 ft	MWOR-1 07/16/90 2.5-3 ft	MWOR-1 07/16/90 7-7.5 ft	MWOR-1 07/16/90 11.5-12 ft	MWOR-1 07/16/90 14.5-15 ft	MWOR-2 07/17/90 2.5-3 ft	MWOR-2 07/17/90 7-7.5 ft
Methylene Chloride (ug/kg)	3300	<14.0	14	14	11	6	23
Acetone (ug/kg)	<1600	<27.0	16	7	13	6	16
Carbon Disulfide (ug/kg)	<790	<14.0	<6.00	<6.00	<6.00	<5.00	<6.00
1,2-Dichloroethene (total) (ug/kg)	<790	<14.0	<6.00	<6.00	<6.00	<5.00	<6.00
2-Butanone (ug/kg)	<1600	<27.0	<11.0	<12.0	4	<11.0	<13.0
Benzene (ug/kg)	<790	<14.0	<6.00	<6.00	<6.00	<5.00	<6.00
2-Hexanone (ug/kg)	<1600	<27.0	<11.0	<12.0	<11.0	<11.0	<13.0
Toluene (ug/kg)	980	450	13	10	12	<5.00	8
Ethylbenzene (ug/kg)	<790	<14.0	<6.00	<6.00	<6.00	<5.00	<6.00
Xylenes (total) (ug/kg)	<790	<14.0	<6.00	<6.00	<6.00	<5.00	<6.00

Notes: NA = Not Analyzed
< = Detection Limit
ug/kg = micrograms per kilogram
Data not validated by JMM

TABLE 12-3

SITE 13 - FORMER OIL REFINERY
RESULTS FOR VOLATILE ORGANIC COMPOUNDS DETECTED IN SOIL SAMPLES
(Sheet 14 of 15)

Parameter Reported	MWOR-2 07/17/90 10-10.5 ft	MWOR-2 07/17/90 12-12.5 ft	MWOR-3 07/17/90 2.5-3 ft	MWOR-3 07/17/90 7-7.5 ft	MWOR-3 07/17/90 10-10.5 ft	MWOR-3 07/17/90 11.5-12 ft	MWOR-4 07/18/90 2.5-3 ft
Methylene Chloride (ug/kg)	22	21	5	14	15	13	7
Acetone (ug/kg)	16	26	7	28	24	42	22
Carbon Disulfide (ug/kg)	<6.00	2	<5.00	<6.00	<6.00	<6.00	<5.00
1,2-Dichloroethene (total) (ug/kg)	<6.00	<6.00	<5.00	<6.00	<6.00	<6.00	<5.00
2-Butanone (ug/kg)	<12.0	4	<10.0	5	<12.0	<12.0	<11.0
Benzene (ug/kg)	<6.00	<6.00	<5.00	<6.00	<6.00	<6.00	<5.00
2-Hexanone (ug/kg)	<12.0	<13.0	<10.0	<12.0	<12.0	<12.0	<11.0
Toluene (ug/kg)	5	2	46	32	8	12	43
Ethylbenzene (ug/kg)	<6.00	<6.00	<5.00	<6.00	<6.00	<6.00	<5.00
Xylenes (total) (ug/kg)	<6.00	<6.00	<5.00	<6.00	<6.00	<6.00	<5.00

Notes: NA = Not Analyzed
< = Detection Limit
ug/kg = micrograms per kilogram
Data not validated by JMM

TABLE 12-3

SITE 13 - FORMER OIL REFINERY
RESULTS FOR VOLATILE ORGANIC COMPOUNDS DETECTED IN SOIL SAMPLES
(Sheet 15 of 15)

Parameter Reported	MWOR-4 07/18/90 6.5-7 ft	MWOR-4 07/18/90 10-10.5 ft	MWOR-4 07/18/90 14-14.5 ft	MWOR-5 07/18/90 7-7.5 ft	MWOR-5 07/18/90 10-10.5 ft	MWOR-5 07/18/90 12.5-13 ft	MWOR-5 07/18/90 14.5-15 ft
Methylene Chloride (ug/kg)	34	11	18	10	10	13	13
Acetone (ug/kg)	48	30	21	18	21	11	27
Carbon Disulfide (ug/kg)	<6.00	<6.00	<6.00	<6.00	<6.00	<6.00	<6.00
1,2-Dichloroethene (total) (ug/kg)	<6.00	<6.00	<6.00	<6.00	<6.00	<6.00	<6.00
2-Butanone (ug/kg)	<12.0	<12.0	<12.0	<12.0	<12.0	<12.0	<12.0
Benzene (ug/kg)	<6.00	<6.00	<6.00	<6.00	<6.00	<6.00	<6.00
2-Hexanone (ug/kg)	<12.0	<12.0	<12.0	<12.0	<12.0	<12.0	<12.0
Toluene (ug/kg)	<6.00	2	<6.00	11	<6.00	2	<6.00
Ethylbenzene (ug/kg)	<6.00	<6.00	<6.00	<6.00	<6.00	<6.00	<6.00
Xylenes (total) (ug/kg)	<6.00	<6.00	<6.00	<6.00	<6.00	<6.00	<6.00

Notes: NA = Not Analyzed
< = Detection Limit
ug/kg = micrograms per kilogram
Data not validated by JMM

TABLE 12-4

SITE 13 - FORMER OIL REFINERY
RESULTS FOR SEMIVOLATILE ORGANIC COMPOUNDS DETECTED IN SOIL SAMPLES
(Sheet 1 of 16)

Parameter Reported	BOR-10 07/12/90 0.5-1 ft	BOR-10 07/12/90 7-7.5 ft	BOR-11 07/18/90 0.5-1 ft	BOR-11 07/18/90 2.5-3 ft	BOR-11 07/18/90 6.5-7 ft	BOR-11 07/18/90 11-11.5 ft	BOR-11 07/18/90 14-14.5 ft
Naphthalene (ug/kg)	<340	<400	<680	78	43	140	74
2-Methylnaphthalene (ug/kg)	<340	<400	<680	<340	<390	<620	<400
Acenaphthene (ug/kg)	<340	<400	<680	<340	<390	410	<400
Diethylphthalate (ug/kg)	<340	<400	<680	<340	<390	<620	<400
Fluorene (ug/kg)	<340	<400	<680	<340	<390	150	<400
n-Nitroso-di-phenylamine (ug/kg)	<340	<400	<680	55	74	83	89
Pentachlorophenol (ug/kg)	<1600	<1900	<3300	<1700	<1900	<3000	<1900
Phenanthrene (ug/kg)	<340	<400	<680	37	<390	290	65
Anthracene (ug/kg)	<340	<400	<680	<340	<390	100	49
Di-n-butylphthalate (ug/kg)	<340	<400	<680	60	53	100	100
Fluoranthene (ug/kg)	<340	<400	98	<340	<390	380	97
Pyrene (ug/kg)	160	<400	<680	50	54	690	150
Butylbenzylphthalate (ug/kg)	<340	<400	<680	<340	<390	<620	140
Benzo(a)anthracene (ug/kg)	<340	<400	<680	52	53	210	120
Chrysene (ug/kg)	<340	<400	180	40	<390	220	110
bis(2-Ethylhexyl)phthalate (ug/kg)	51	60	<680	64	63	180	230
Di-n-octylphthalate (ug/kg)	<340	<400	<680	<340	<390	<620	<400
Benzo(b)fluoranthene (ug/kg)	120	<400	<680	<340	<390	440	<400
Benzo(k)fluoranthene (ug/kg)	<340	<400	<680	<340	<390	150	<400
Benzo(a)pyrene (ug/kg)	130	<400	<680	<340	<390	400	<400
Indeno(1,2,3-cd)pyrene (ug/kg)	<340	<400	<680	<340	<390	<620	<400
Benzo(g,h,i)perylene (ug/kg)	<340	<400	<680	<340	<390	290	<400

Notes: NA = Not Analyzed
< = Detection Limit
ug/kg= micrograms per kilogram
Data not validated by JMM

TABLE 12-4

SITE 13 - FORMER OIL REFINERY
RESULTS FOR SEMIVOLATILE ORGANIC COMPOUNDS DETECTED IN SOIL SAMPLES
(Sheet 2 of 16)

Parameter Reported	BOR-12 07/18/90 0.5-1 ft	BOR-12 07/18/90 3.5-4 ft	BOR-12 07/18/90 8.5-9 ft	BOR-12 07/18/90 11-11.5 ft	BOR-12 07/18/90 14-14.5 ft	BOR-13 07/03/90 0.5-1 ft	BOR-13 07/03/90 11-11.5 ft
Naphthalene (ug/kg)	<680	39	72	<1200	<400	<6800	<350
2-Methylnaphthalene (ug/kg)	<680	<350	<400	<1200	<400	<6800	<350
Acenaphthene (ug/kg)	<680	<350	<400	<1200	<400	<6800	<350
Diethylphthalate (ug/kg)	<680	<350	<400	<1200	<400	<6800	<350
Fluorene (ug/kg)	<680	<350	<400	<1200	<400	<6800	<350
n-Nitroso-di-phenylamine (ug/kg)	220	65	70	220	87	<6800	<350
Pentachlorophenol (ug/kg)	<3300	<1700	<1900	<5700	<1900	<33000	<1700
Phenanthrene (ug/kg)	140	<350	42	200	52	<6800	<350
Anthracene (ug/kg)	<680	<350	<400	<1200	40	<6800	<350
Di-n-butylphthalate (ug/kg)	78	48	60	130	90	12000	1000
Fluoranthene (ug/kg)	<680	<350	<400	350	83	<6800	<350
Pyrene (ug/kg)	78	<350	60	880	100	<6800	<350
Butylbenzylphthalate (ug/kg)	<680	<350	<400	<1200	110	<6800	<350
Benzo(a)anthracene (ug/kg)	<680	<350	50	210	100	<6800	<350
Chrysene (ug/kg)	180	<350	<400	230	100	<6800	<350
bis(2-Ethylhexyl)phthalate (ug/kg)	<680	140	66	270	170	<6800	<350
Di-n-octylphthalate (ug/kg)	<680	140	<400	<1200	<400	<6800	<350
Benzo(b)fluoranthene (ug/kg)	<680	<350	<400	450	<400	<6800	<350
Benzo(k)fluoranthene (ug/kg)	<680	<350	<400	170	<400	<6800	<350
Benzo(a)pyrene (ug/kg)	<680	<350	<400	380	<400	<6800	<350
Indeno(1,2,3-cd)pyrene (ug/kg)	<680	<350	<400	260	<400	<6800	<350
Benzo(g,h,i)perylene (ug/kg)	<680	<350	<400	320	<400	<6800	<350

Notes: NA = Not Analyzed
< = Detection Limit
ug/kg= nucrogrqams per kilogram
Data not validated by JMM

TABLE 12-4

SITE 13 - FORMER OIL REFINERY
RESULTS FOR SEMIVOLATILE ORGANIC COMPOUNDS DETECTED IN SOIL SAMPLES
(Sheet 3 of 16)

Parameter Reported	BOR-13 07/03/90 14-14.5 ft	BOR-15 07/18/90 0.5-1 ft	BOR-15 07/18/90 2-2.5 ft	BOR-15 07/18/90 6.5-7 ft	BOR-15 07/18/90 11-11.5 ft	BOR-15 07/18/90 14-14.5 ft	BOR-17 07/17/90 2-2.5 ft
Naphthalene (ug/kg)	<400	<670	79	65	58	<390	<350
2-Methylnaphthalene (ug/kg)	<400	<670	<670	<390	50	<390	<350
Acenaphthene (ug/kg)	<400	<670	<670	<390	<420	<390	<350
Diethylphthalate (ug/kg)	<400	<670	<670	<390	52	<390	<350
Fluorene (ug/kg)	<400	<670	<670	<390	<420	<390	<350
n-Nitroso-di-phenylamine (ug/kg)	<400	140	170	71	<420	52	<350
Pentachlorophenol (ug/kg)	<1900	<3300	<3200	<1900	<2100	<1900	<1700
Phenanthrene (ug/kg)	<400	<670	68	<390	53	<390	<350
Anthracene (ug/kg)	<400	<670	<670	<390	<420	<390	<350
Di-n-butylphthalate (ug/kg)	600	100	<670	64	49	40	<350
Fluoranthene (ug/kg)	<400	85	80	<390	<420	<390	<350
Pyrene (ug/kg)	<400	<670	120	<390	<420	<390	<350
Butylbenzylphthalate (ug/kg)	<400	<670	<670	<390	<420	<390	<350
Benzo(a)anthracene (ug/kg)	<400	110	<670	54	<420	<390	<350
Chrysene (ug/kg)	<400	<670	<670	<390	<420	<390	<350
bis(2-Ethylhexyl)phthalate (ug/kg)	<400	<670	<670	<390	65	69	93
Di-n-octylphthalate (ug/kg)	<400	<670	<670	<390	<420	<390	<350
Benzo(b)fluoranthene (ug/kg)	<400	<670	<670	<390	<420	<390	<350
Benzo(k)fluoranthene (ug/kg)	<400	<670	<670	<390	<420	<390	<350
Benzo(a)pyrene (ug/kg)	<400	<670	<670	<390	<420	<390	<350
Indeno(1,2,3-cd)pyrene (ug/kg)	<400	<670	<670	<390	<420	<390	<350
Benzo(g,h,i)perylene (ug/kg)	<400	<670	<670	<390	<420	<390	<350

Notes: NA = Not Analyzed
< = Detection Limit
ug/kg= micrograms per kilogram
Data not validated by JMM

TABLE 12-4

SITE 13 - FORMER OIL REFINERY
RESULTS FOR SEMIVOLATILE ORGANIC COMPOUNDS DETECTED IN SOIL SAMPLES
(Sheet 4 of 16)

Parameter Reported	BOR-17 07/17/90 2.5-3 ft	BOR-17 07/17/90 7-7.5 ft	BOR-17 07/17/90 10-10.5 ft	BOR-17 07/17/90 11.5-12 ft	BOR-17R 07/17/90 10.5-11 ft	BOR-18 07/23/90 0.5-1 ft	BOR-18 07/23/90 3.5-4 ft
Naphthalene (ug/kg)	<1800	360	4100	<400	800	<800	<430
2-Methylnaphthalene (ug/kg)	<1800	230	8300	210	3100	<800	<430
Acenaphthene (ug/kg)	<1800	<400	<780	<400	<380	<800	<430
Diethylphthalate (ug/kg)	<1800	<400	<780	<400	<380	<800	<430
Fluorene (ug/kg)	<1800	41	310	<400	230	<800	<430
n-Nitroso-di-phenylamine (ug/kg)	<1800	<400	<780	<400	<380	<800	<430
Pentachlorophenol (ug/kg)	<8900	<2000	<3800	<2000	<1800	<3900	<2100
Phenanthrene (ug/kg)	250	<400	450	55	360	<800	<430
Anthracene (ug/kg)	<1800	<400	<780	<400	<380	<800	<430
Di-n-butylphthalate (ug/kg)	<1800	<400	<780	<400	63	970	2000
Fluoranthene (ug/kg)	<1800	<400	<780	<400	<380	<800	<430
Pyrene (ug/kg)	<1800	68	<780	<400	<380	<800	<430
Butylbenzylphthalate (ug/kg)	<1800	<400	<780	<400	<380	4600	<430
Benzo(a)anthracene (ug/kg)	<1800	<400	<780	<400	<380	<800	<430
Chrysene (ug/kg)	<1800	120	<780	<400	<380	<800	<430
bis(2-Ethylhexyl)phthalate (ug/kg)	<1800	360	<780	99	93	<800	<430
Di-n-octylphthalate (ug/kg)	<1800	<400	<780	<400	<380	<800	<430
Benzo(b)fluoranthene (ug/kg)	<1800	<400	<780	<400	<380	<800	<430
Benzo(k)fluoranthene (ug/kg)	<1800	<400	<780	<400	<380	<800	<430
Benzo(a)pyrene (ug/kg)	<1800	<400	<780	<400	<380	<800	<430
Indeno(1,2,3-cd)pyrene (ug/kg)	<1800	<400	<780	<400	<380	<800	<430
Benzo(g,h,i)perylene (ug/kg)	<1800	<400	<780	<400	<380	<800	<430

Notes: NA = Not Analyzed
< = Detection Limit
ug/kg= nucrogrqams per kilogram
Data not validated by JMM

TABLE 12-4

SITE 13 - FORMER OIL REFINERY
RESULTS FOR SEMIVOLATILE ORGANIC COMPOUNDS DETECTED IN SOIL SAMPLES
(Sheet 5 of 16)

Parameter Reported	BOR-18 07/23/90 7-7.5 ft	BOR-19 07/18/90 0.5-1 ft	BOR-19 07/18/90 2.5-3 ft	BOR-19 07/18/90 7-7.5 ft	BOR-19 07/18/90 11-11.5 ft	BOR-19 07/18/90 14-14.5 ft	BOR-20 07/17/90 2.5-3 ft
Naphthalene (ug/kg)	<430	<6900	51	42	5400	50	<340
2-Methylnaphthalene (ug/kg)	<430	<6900	<350	<410	17000	<390	<340
Acenaphthene (ug/kg)	<430	<6900	<350	<410	<3900	<390	<340
Diethylphthalate (ug/kg)	<430	<6900	<350	<410	<3900	<390	<340
Fluorene (ug/kg)	<430	<6900	<350	<410	790	<390	<340
n-Nitroso-di-phenylamine (ug/kg)	<430	1200	<350	59	2700	45	<340
Pentachlorophenol (ug/kg)	<2100	<33000	<1700	<2000	<19000	<1900	<1600
Phenanthrene (ug/kg)	<430	<6900	63	<410	760	<390	<340
Anthracene (ug/kg)	<430	<6900	<350	<410	<3900	<390	<340
Di-n-butylphthalate (ug/kg)	450	<6900	<350	<410	<3900	43	<340
Fluoranthene (ug/kg)	<430	<6900	<350	<410	<3900	<390	<340
Pyrene (ug/kg)	<430	<6900	<350	<410	<3900	<390	<340
Butylbenzylphthalate (ug/kg)	<430	<6900	<350	<410	<3900	<390	<340
Benzo(a)anthracene (ug/kg)	<430	<6900	<350	<410	<3900	<390	<340
Chrysene (ug/kg)	<430	2300	46	<410	<3900	<390	<340
bis(2-Ethylhexyl)phthalate (ug/kg)	<430	<6900	69	160	<3900	35	63
Di-n-octylphthalate (ug/kg)	<430	<6900	<350	<410	<3900	<390	<340
Benzo(b)fluoranthene (ug/kg)	<430	<6900	<350	<410	<3900	<390	<340
Benzo(k)fluoranthene (ug/kg)	<430	<6900	<350	<410	<3900	<390	<340
Benzo(a)pyrene (ug/kg)	<430	<6900	<350	<410	<3900	<390	<340
Indeno(1,2,3-cd)pyrene (ug/kg)	<430	<6900	<350	<410	<3900	<390	<340
Benzo(g,h,i)perylene (ug/kg)	<430	<6900	<350	<410	<3900	<390	<340

Notes: NA = Not Analyzed
< = Detection Limit
ug/kg= micrograms per kilogram
Data not validated by JMM

TABLE 12-4

SITE 13 - FORMER OIL REFINERY
RESULTS FOR SEMIVOLATILE ORGANIC COMPOUNDS DETECTED IN SOIL SAMPLES
(Sheet 6 of 16)

Parameter Reported	BOR-20 07/17/90 3-3.5 ft	BOR-20 07/17/90 6-6.5 ft	BOR-20 07/17/90 10-10.5 ft	BOR-20 07/17/90 11.5-12 ft	BOR-20R 07/17/90 5.5-6 ft	BOR-21 07/19/90 0.5-1 ft	BOR-21 07/18/90 2.5-3 ft
Naphthalene (ug/kg)	<340	<400	<410	<390	<390	<350	48
2-Methylnaphthalene (ug/kg)	<340	<400	<410	<390	<390	<350	<350
Acenaphthene (ug/kg)	<340	<400	<410	<390	<390	<350	<350
Diethylphthalate (ug/kg)	<340	<400	<410	<390	<390	<350	<350
Fluorene (ug/kg)	<340	<400	<410	<390	<390	<350	<350
n-Nitroso-di-phenylamine (ug/kg)	<340	<400	<410	<390	<390	57	47
Pentachlorophenol (ug/kg)	<1700	<1900	<2000	<1900	<1900	<1700	<1700
Phenanthrene (ug/kg)	<340	<400	<410	<390	<390	190	<350
Anthracene (ug/kg)	<340	<400	<410	<390	<390	40	<350
Di-n-butylphthalate (ug/kg)	<340	<400	<410	<390	<390	48	40
Fluoranthene (ug/kg)	<340	<400	<410	86	<390	440	<350
Pyrene (ug/kg)	<340	<400	<410	110	<390	380	<350
Butylbenzylphthalate (ug/kg)	<340	<400	<410	<390	<390	<350	<350
Benzo(a)anthracene (ug/kg)	<340	<400	<410	<390	<390	170	<350
Chrysene (ug/kg)	<340	<400	<410	<390	<390	230	<350
bis(2-Ethylhexyl)phthalate (ug/kg)	56	160	250	160	55	50	76
Di-n-octylphthalate (ug/kg)	<340	<400	<410	<390	<390	<350	<350
Benzo(b)fluoranthene (ug/kg)	<340	<400	<410	<390	<390	<350	<350
Benzo(k)fluoranthene (ug/kg)	<340	<400	<410	<390	<390	<350	<350
Benzo(a)pyrene (ug/kg)	<340	<400	<410	64	<390	63	<350
Indeno(1,2,3-cd)pyrene (ug/kg)	<340	<400	<410	<390	<390	<350	<350
Benzo(g,h,i)perylene (ug/kg)	<340	<400	<410	<390	<390	<350	<350

Notes: NA = Not Analyzed
< = Detection Limit
ug/kg= micrograms per kilogram
Data not validated by JMM

TABLE 12-4

SITE 13 - FORMER OIL REFINERY
RESULTS FOR SEMIVOLATILE ORGANIC COMPOUNDS DETECTED IN SOIL SAMPLES
(Sheet 7 of 16)

Parameter Reported	BOR-21 07/19/90 7-7.5 ft	BOR-21 07/19/90 11.5-12 ft	BOR-21 07/18/90 14-14.5 ft	BOR-22 07/23/90 0.5-1 ft	BOR-22 07/23/90 2.5-3 ft	BOR-22 07/23/90 7.5-8 ft	BOR-22 07/23/90 14-14.5 ft
Naphthalene (ug/kg)	43	42	<400	<760	<390	<390	<400
2-Methylnaphthalene (ug/kg)	<400	<400	<400	<760	<390	<390	<400
Acenaphthene (ug/kg)	<400	<400	<400	<760	<390	<390	<400
Diethylphthalate (ug/kg)	<400	<400	<400	<760	<390	<390	<400
Fluorene (ug/kg)	<400	<400	<400	<760	<390	<390	<400
n-Nitroso-di-phenylamine (ug/kg)	69	79	52	<760	<390	<390	<400
Pentachlorophenol (ug/kg)	<2000	<1900	<1900	<3700	<1900	<1900	<2000
Phenanthrene (ug/kg)	<400	<400	<400	<760	<390	<390	<400
Anthracene (ug/kg)	<400	<400	<400	<760	<390	<390	<400
Di-n-butylphthalate (ug/kg)	44	43	42	940	980	1000	890
Fluoranthene (ug/kg)	<400	<400	<400	<760	<390	<390	<400
Pyrene (ug/kg)	<400	<400	<400	<760	<390	<390	<400
Butylbenzylphthalate (ug/kg)	<400	<400	<400	4400	<390	<390	<400
Benzo(a)anthracene (ug/kg)	<400	<400	<400	<760	<390	<390	<400
Chrysene (ug/kg)	<400	<400	<400	<760	<390	<390	<400
bis(2-Ethylhexyl)phthalate (ug/kg)	62	57	130	<760	<390	<390	<400
Di-n-octylphthalate (ug/kg)	<400	<400	<400	<760	<390	<390	<400
Benzo(b)fluoranthene (ug/kg)	<400	<400	<400	<760	<390	<390	<400
Benzo(k)fluoranthene (ug/kg)	<400	<400	<400	<760	<390	<390	<400
Benzo(a)pyrene (ug/kg)	<400	<400	<400	<760	<390	<390	<400
Indeno(1,2,3-cd)pyrene (ug/kg)	<400	<400	<400	<760	<390	<390	<400
Benzo(g,h,i)perylene (ug/kg)	<400	<400	<400	<760	<390	<390	<400

Notes: NA = Not Analyzed
< = Detection Limit
ug/kg= micrograms per kilogram
Data not validated by JMM

TABLE 12-4

SITE 13 - FORMER OIL REFINERY
RESULTS FOR SEMIVOLATILE ORGANIC COMPOUNDS DETECTED IN SOIL SAMPLES
(Sheet 8 of 16)

Parameter Reported	BOR-23 07/20/90 1-1.5 ft	BOR-23 07/20/90 3-3.5 ft	BOR-23 07/20/90 8.5-9 ft	BOR-23 07/20/90 11-11.5 ft	BOR-23 07/20/90 14.5-15 ft	BOR-24 07/19/90 1-1.5 ft	BOR-24 07/18/90 2.5-3 ft
Naphthalene (ug/kg)	39	<350	<400	99	49	<350	38
2-Methylnaphthalene (ug/kg)	<340	<350	<400	<610	<400	<350	<360
Acenaphthene (ug/kg)	<340	<350	<400	<610	<400	<350	<360
Diethylphthalate (ug/kg)	<340	<350	<400	<610	<400	48	<360
Fluorene (ug/kg)	<340	<350	<400	<610	<400	<350	<360
n-Nitroso-di-phenylamine (ug/kg)	<340	<350	<400	<610	<400	47	42
Pentachlorophenol (ug/kg)	<1600	<1700	<2000	<3000	<2000	<1700	<1700
Phenanthrene (ug/kg)	<340	<350	<400	<610	<400	<350	<360
Anthracene (ug/kg)	<340	<350	<400	<610	<400	<350	<360
Di-n-butylphthalate (ug/kg)	<340	<350	<400	73	<400	<350	36
Fluoranthene (ug/kg)	<340	<350	<400	<610	<400	42	<360
Pyrene (ug/kg)	<340	<350	<400	650	<400	46	<360
Butylbenzylphthalate (ug/kg)	<340	<350	<400	<610	<400	<350	<360
Benzo(a)anthracene (ug/kg)	<340	<350	<400	230	<400	<350	<360
Chrysene (ug/kg)	<340	<350	<400	320	<400	<350	<360
bis(2-Ethylhexyl)phthalate (ug/kg)	<340	160	82	86	<400	<350	<360
Di-n-octylphthalate (ug/kg)	<340	<350	<400	<610	<400	<350	<360
Benzo(b)fluoranthene (ug/kg)	<340	<350	<400	330	<400	<350	<360
Benzo(k)fluoranthene (ug/kg)	<340	<350	<400	310	<400	<350	<360
Benzo(a)pyrene (ug/kg)	<340	<350	<400	450	<400	<350	<360
Indeno(1,2,3-cd)pyrene (ug/kg)	<340	<350	<400	390	<400	<350	<360
Benzo(g,h,i)perylene (ug/kg)	<340	<350	<400	460	<400	<350	<360

Notes: NA = Not Analyzed
< = Detection Limit
ug/kg= micrograms per kilogram
Data not validated by JMM

TABLE 12-4

SITE 13 - FORMER OIL REFINERY
RESULTS FOR SEMIVOLATILE ORGANIC COMPOUNDS DETECTED IN SOIL SAMPLES
(Sheet 9 of 16)

Parameter Reported	BOR-24 07/18/90 7-7.5 ft	BOR-24 07/18/90 11-11.5 ft	BOR-24 07/18/90 14-14.5 ft	BOR-25 07/20/90 2.5-3 ft	BOR-25 07/20/90 6.5-7 ft	BOR-25 07/20/90 11-11.5 ft	BOR-25 07/20/90 14-14.5 ft
Naphthalene (ug/kg)	41	41	47	<350	<380	<400	44
2-Methylnaphthalene (ug/kg)	<390	<390	<400	<350	<380	<400	<410
Acenaphthene (ug/kg)	<390	<390	<400	<350	<380	<400	<410
Diethylphthalate (ug/kg)	<390	<390	<400	<350	<380	<400	<410
Fluorene (ug/kg)	<390	<390	<400	<350	<380	<400	<410
n-Nitroso-di-phenylamine (ug/kg)	48	49	49	<350	<380	<400	<410
Pentachlorophenol (ug/kg)	<1900	<1900	<1900	<1700	<1900	<2000	<2000
Phenanthrene (ug/kg)	<390	<390	<400	<350	<380	<400	<410
Anthracene (ug/kg)	<390	<390	<400	<350	<380	<400	<410
Di-n-butylphthalate (ug/kg)	45	43	44	<350	<380	<400	<410
Fluoranthene (ug/kg)	<390	<390	<400	<350	<380	<400	<410
Pyrene (ug/kg)	<390	<390	<400	<350	<380	<400	<410
Butylbenzylphthalate (ug/kg)	<390	<390	<400	<350	<380	<400	<410
Benzo(a)anthracene (ug/kg)	<390	<390	<400	<350	<380	<400	<410
Chrysene (ug/kg)	<390	<390	<400	<350	<380	<400	<410
bis(2-Ethylhexyl)phthalate (ug/kg)	<390	83	72	120	62	69	<410
Di-n-octylphthalate (ug/kg)	<390	<390	<400	<350	<380	<400	<410
Benzo(b)fluoranthene (ug/kg)	<390	<390	<400	<350	<380	<400	<410
Benzo(k)fluoranthene (ug/kg)	<390	<390	<400	<350	<380	<400	<410
Benzo(a)pyrene (ug/kg)	<390	<390	<400	<350	<380	<400	<410
Indeno(1,2,3-cd)pyrene (ug/kg)	<390	<390	<400	<350	<380	<400	<410
Benzo(g,h,i)perylene (ug/kg)	<390	<390	<400	<350	<380	<400	<410

Notes: NA = Not Analyzed
< = Detection Limit
ug/kg= micrograms per kilogram
Data not validated by JMM

TABLE 12-4

SITE 13 - FORMER OIL REFINERY
RESULTS FOR SEMIVOLATILE ORGANIC COMPOUNDS DETECTED IN SOIL SAMPLES
(Sheet 10 of 16)

Parameter Reported	BOR-26 07/24/90 5.5-6 ft	BOR-26 07/24/90 10-10.5 ft	BOR-26 07/24/90 13-13.5 ft	BOR-27 07/20/90 1-1.5 ft	BOR-27 07/20/90 7-7.5 ft	BOR-27 07/20/90 12.5-13 ft	BOR-6 07/05/90 5.5-6 ft
Naphthalene (ug/kg)	<390	<400	<400	41	49	75	<380
2-Methylnaphthalene (ug/kg)	<390	<400	<400	<340	<390	<610	<380
Acenaphthene (ug/kg)	<390	<400	<400	<340	<390	<610	<380
Diethylphthalate (ug/kg)	56	<400	<400	<340	<390	<610	<380
Fluorene (ug/kg)	<390	<400	<400	<340	<390	<610	<380
n-Nitroso-di-phenylamine (ug/kg)	<390	<400	<400	<340	<390	<610	<380
Pentachlorophenol (ug/kg)	<1900	<1900	<2000	<1700	<1900	<3000	<1800
Phenanthrene (ug/kg)	<390	<400	<400	<340	<390	70	<380
Anthracene (ug/kg)	<390	<400	<400	<340	<390	<610	<380
Di-n-butylphthalate (ug/kg)	130	280	510	45	130	<610	<380
Fluoranthene (ug/kg)	<390	<400	110	<340	<390	<610	<380
Pyrene (ug/kg)	<390	<400	160	<340	<390	430	<380
Butylbenzylphthalate (ug/kg)	<390	<400	<400	<340	<390	<610	<380
Benzo(a)anthracene (ug/kg)	<390	<400	55	<340	<390	110	<380
Chrysene (ug/kg)	<390	<400	65	<340	<390	150	<380
bis(2-Ethylhexyl)phthalate (ug/kg)	<390	<400	110	45	59	<610	63
Di-n-octylphthalate (ug/kg)	<390	<400	<400	<340	<390	<610	<380
Benzo(b)fluoranthene (ug/kg)	<390	<400	<400	<340	<390	220	<380
Benzo(k)fluoranthene (ug/kg)	<390	<400	<400	<340	<390	240	<380
Benzo(a)pyrene (ug/kg)	<390	<400	<400	<340	<390	320	<380
Indeno(1,2,3-cd)pyrene (ug/kg)	<390	<400	<400	<340	<390	340	<380
Benzo(g,h,i)perylene (ug/kg)	<390	<400	62	<340	<390	340	<380

Notes: NA = Not Analyzed
< = Detection Limit
ug/kg= micrograms per kilogram
Data not validated by JMM

TABLE 12-4

SITE 13 - FORMER OIL REFINERY
RESULTS FOR SEMIVOLATILE ORGANIC COMPOUNDS DETECTED IN SOIL SAMPLES
(Sheet 11 of 16)

Parameter Reported	BOR-6 07/05/90 8-8.5 ft	BOR-6 07/05/90 11-11.5 ft	BOR-6 07/05/90 14-14.5 ft	BOR-7 07/05/90 0.5-1 ft	BOR-7 07/05/90 2.5-3 ft	BOR-7 07/05/90 4-4.5 ft	BOR-7 07/05/90 8.5-9 ft
Naphthalene (ug/kg)	<390	<380	<400	<340	49	59	<400
2-Methylnaphthalene (ug/kg)	<390	<380	<400	<340	<370	<380	<400
Acenaphthene (ug/kg)	<390	<380	<400	<340	<370	<380	<400
Diethylphthalate (ug/kg)	<390	69	<400	<340	570	76	<400
Fluorene (ug/kg)	<390	<380	<400	<340	<370	<380	<400
n-Nitroso-di-phenylamine (ug/kg)	<390	<380	<400	<340	<370	<380	<400
Pentachlorophenol (ug/kg)	<1900	<1800	<2000	640	270	1000	170
Phenanthrene (ug/kg)	<390	<380	<400	<340	94	<380	<400
Anthracene (ug/kg)	<390	<380	<400	<340	<370	<380	<400
Di-n-butylphthalate (ug/kg)	<390	<380	50	<340	<370	<380	<400
Fluoranthene (ug/kg)	<390	<380	<400	<340	170	<380	<400
Pyrene (ug/kg)	<390	<380	<400	<340	160	<380	<400
Butylbenzylphthalate (ug/kg)	<390	<380	<400	<340	<370	<380	<400
Benzo(a)anthracene (ug/kg)	<390	<380	<400	<340	84	<380	<400
Chrysene (ug/kg)	<390	<380	<400	<340	130	<380	<400
bis(2-Ethylhexyl)phthalate (ug/kg)	83	77	<400	870	90	1100	210
Di-n-octylphthalate (ug/kg)	<390	<380	<400	<340	<370	<380	<400
Benzo(b)fluoranthene (ug/kg)	<390	<380	<400	<340	95	<380	<400
Benzo(k)fluoranthene (ug/kg)	<390	<380	<400	<340	110	<380	<400
Benzo(a)pyrene (ug/kg)	<390	<380	<400	<340	120	<380	<400
Indeno(1,2,3-cd)pyrene (ug/kg)	<390	<380	<400	<340	90	<380	<400
Benzo(g,h,i)perylene (ug/kg)	<390	<380	<400	<340	100	<380	<400

Notes: NA = Not Analyzed
< = Detection Limit
ug/kg= micrograms per kilogram
Data not validated by JMM

TABLE 12-4

SITE 13 - FORMER OIL REFINERY
RESULTS FOR SEMIVOLATILE ORGANIC COMPOUNDS DETECTED IN SOIL SAMPLES
(Sheet 12 of 16)

Parameter Reported	BOR-7 07/05/90 13.5-14 ft	BOR-8 07/16/90 1-1.5 ft	BOR-8 07/16/90 4-4.5 ft	BOR-8 07/16/90 7-7.5 ft	BOR-8 07/16/90 11-11.5 ft	BOR-8 07/16/90 14-14.5 ft	BOR-9 07/23/90 14-14.5 ft
Naphthalene (ug/kg)	<390	<350	<370	<390	<420	<370	5300
2-Methylnaphthalene (ug/kg)	<390	<350	<370	<390	<420	<370	13000
Acenaphthene (ug/kg)	<390	<350	<370	<390	<420	<370	<1700
Diethylphthalate (ug/kg)	<390	<350	<370	<390	<420	<370	<1700
Fluorene (ug/kg)	<390	<350	<370	<390	<420	<370	<1700
n-Nitroso-di-phenylamine (ug/kg)	<390	45	51	47	61	49	<1700
Pentachlorophenol (ug/kg)	<1900	<1700	<1800	<1900	<2000	<1800	<8100
Phenanthrene (ug/kg)	<390	<350	<370	<390	260	<370	1800
Anthracene (ug/kg)	<390	<350	<370	<390	75	<370	<1700
Di-n-butylphthalate (ug/kg)	<390	<350	<370	<390	<420	<370	<1700
Fluoranthene (ug/kg)	<390	<350	<370	<390	800	<370	<1700
Pyrene (ug/kg)	<390	<350	<370	<390	1900	<370	<1700
Butylbenzylphthalate (ug/kg)	<390	<350	<370	<390	<420	<370	<1700
Benzo(a)anthracene (ug/kg)	<390	<350	<370	<390	390	<370	<1700
Chrysene (ug/kg)	<390	<350	<370	<390	480	<370	<1700
bis(2-Ethylhexyl)phthalate (ug/kg)	75	<350	<370	<390	<420	<370	<1700
Di-n-octylphthalate (ug/kg)	<390	<350	<370	<390	<420	<370	<1700
Benzo(b)fluoranthene (ug/kg)	<390	<350	<370	<390	1100	<370	<1700
Benzo(k)fluoranthene (ug/kg)	<390	<350	<370	<390	410	<370	<1700
Benzo(a)pyrene (ug/kg)	<390	<350	<370	<390	190	<370	<1700
Indeno(1,2,3-cd)pyrene (ug/kg)	<390	<350	<370	<390	690	<370	<1700
Benzo(g,h,i)perylene (ug/kg)	<390	<350	<370	<390	1400	<370	<1700

Notes: NA = Not Analyzed
< = Detection Limit
ug/kg= micrograms per kilogram
Data not validated by JMM

TABLE 12-4

SITE 13 - FORMER OIL REFINERY
RESULTS FOR SEMIVOLATILE ORGANIC COMPOUNDS DETECTED IN SOIL SAMPLES
(Sheet 13 of 16)

Parameter Reported	MWOR-1 07/16/90 1-1.5 ft	MWOR-1 07/16/90 2.5-3 ft	MWOR-1 07/16/90 14.5-15 ft	MWOR-2 07/17/90 2.5-3 ft	MWOR-2 07/17/90 10-10.5 ft	MWOR-2 07/17/90 12-12.5 ft	MWOR-2R 07/17/90 12.5-13 ft
Naphthalene (ug/kg)	<350	<710	<380	<350	<400	<410	<400
2-Methylnaphthalene (ug/kg)	<350	<710	<380	<350	<400	<410	<400
Acenaphthene (ug/kg)	<350	<710	<380	<350	<400	<410	<400
Diethylphthalate (ug/kg)	<350	<710	<380	<350	<400	<410	<400
Fluorene (ug/kg)	<350	<710	<380	<350	<400	<410	<400
n-Nitroso-di-phenylamine (ug/kg)	53	<710	[illegible]	<350	<400	<410	<400
Pentachlorophenol (ug/kg)	<1700	<3500	<1800	<1700	<2000	<2000	<2000
Phenanthrene (ug/kg)	<350	<710	<380	<350	<400	220	<400
Anthracene (ug/kg)	<350	<710	<380	<350	<400	61	<400
Di-n-butylphthalate (ug/kg)	<350	<710	<380	<350	55	82	110
Fluoranthene (ug/kg)	<350	<710	<380	<350	<400	520	<400
Pyrene (ug/kg)	<350	<710	<380	<350	<400	810	<400
Butylbenzylphthalate (ug/kg)	<350	<710	<380	<350	<400	<410	<400
Benzo(a)anthracene (ug/kg)	<350	<710	<380	<350	<400	230	<400
Chrysene (ug/kg)	<350	<710	<380	<350	<400	310	<400
bis(2-Ethylhexyl)phthalate (ug/kg)	<350	110	<380	210	<400	<410	<400
Di-n-octylphthalate (ug/kg)	<350	<710	<380	<350	<400	<410	<400
Benzo(b)fluoranthene (ug/kg)	<350	<710	<380	<350	<400	330	<400
Benzo(k)fluoranthene (ug/kg)	<350	<710	<380	<350	<400	510	<400
Benzo(a)pyrene (ug/kg)	<350	<710	<380	<350	<400	520	<400
Indeno(1,2,3-cd)pyrene (ug/kg)	<350	<710	<380	<350	<400	280	<400
Benzo(g,h,i)perylene (ug/kg)	<350	<710	<380	<350	<400	350	<400

Notes: NA = Not Analyzed
< = Detection Limit
ug/kg = micrograms per kilogram
Data not validated by JMM

TABLE 12-4

SITE 13 - FORMER OIL REFINERY
RESULTS FOR SEMIVOLATILE ORGANIC COMPOUNDS DETECTED IN SOIL SAMPLES
(Sheet 14 of 16)

Parameter Reported	MWOR-3 07/17/90 2-2.5 ft	MWOR-3 07/17/90 2.5-3 ft	MWOR-3 07/17/90 7-7.5 ft	MWOR-3 07/17/90 10-10.5 ft	MWOR-3 07/17/90 11.5-12 ft	MWOR-3R 07/17/90 10.5-11 ft	MWOR-4 07/19/90 1.5-2 ft
Naphthalene (ug/kg)	<340	<340	<380	<390	<390	<390	40
2-Methylnaphthalene (ug/kg)	<340	<340	<380	<390	<390	<390	<350
Acenaphthene (ug/kg)	<340	<340	<380	<390	<390	<390	<350
Diethylphthalate (ug/kg)	<340	<340	<380	<390	66	<390	<350
Fluorene (ug/kg)	<340	<340	<380	<390	<390	<390	<350
n-Nitroso-di-phenylamine (ug/kg)	<340	<340	<380	<390	<390	<390	43
Pentachlorophenol (ug/kg)	<1700	<1700	<1900	<1900	<1900	<1900	<1700
Phenanthrene (ug/kg)	<340	<340	<380	<390	<390	<390	<350
Anthracene (ug/kg)	<340	<340	<380	<390	<390	<390	<350
Di-n-butylphthalate (ug/kg)	<340	35	52	<390	<390	<390	37
Fluoranthene (ug/kg)	<340	<340	<380	<390	<390	<390	<350
Pyrene (ug/kg)	<340	<340	<380	<390	<390	<390	<350
Butylbenzylphthalate (ug/kg)	<340	<340	<380	<390	<390	<390	<350
Benzo(a)anthracene (ug/kg)	<340	<340	<380	<390	<390	<390	<350
Chrysene (ug/kg)	<340	<340	<380	<390	<390	<390	<350
bis(2-Ethylhexyl)phthalate (ug/kg)	42	<340	49	50	84	150	58
Di-n-octylphthalate (ug/kg)	<340	<340	<380	<390	<390	<390	<350
Benzo(b)fluoranthene (ug/kg)	<340	<340	<380	<390	<390	<390	<350
Benzo(k)fluoranthene (ug/kg)	<340	<340	<380	<390	<390	<390	<350
Benzo(a)pyrene (ug/kg)	<340	<340	<380	<390	<390	<390	<350
Indeno(1,2,3-cd)pyrene (ug/kg)	<340	<340	<380	<390	<390	<390	<350
Benzo(g,h,i)perylene (ug/kg)	<340	<340	<380	<390	<390	<390	<350

Notes: NA = Not Analyzed
< = Detection Limit
ug/kg= micrograms per kilogram
Data not validated by JMM

TABLE 12-4

SITE 13 - FORMER OIL REFINERY
RESULTS FOR SEMIVOLATILE ORGANIC COMPOUNDS DETECTED IN SOIL SAMPLES
(Sheet 15 of 16)

Parameter Reported	MWOR-4 07/18/90 2.5-3 ft	MWOR-4 07/18/90 6.5-7 ft	MWOR-4 07/18/90 10-10.5 ft	MWOR-4 07/18/90 14-14.5 ft	MWOR-5 07/19/90 1-1.5 ft	MWOR-5 07/18/90 7-7.5 ft	MWOR-5 07/18/90 10-10.5 ft
Naphthalene (ug/kg)	36	<400	47	43	38	53	45
2-Methylnaphthalene (ug/kg)	<360	<400	<390	<400	<350	<390	<390
Acenaphthene (ug/kg)	<360	<400	<390	<400	<350	<390	<390
Diethylphthalate (ug/kg)	<360	<400	<390	<400	<350	<390	<390
Fluorene (ug/kg)	<360	<400	<390	<400	<350	<390	<390
n-Nitroso-di-phenylamine (ug/kg)	72	46	<390	<400	46	55	50
Pentachlorophenol (ug/kg)	<1800	<1900	<1900	<1900	<1700	<1900	<1900
Phenanthrene (ug/kg)	51	<400	<390	<400	<350	370	<390
Anthracene (ug/kg)	<360	<400	<390	<400	<350	85	<390
Di-n-butylphthalate (ug/kg)	54	42	48	<400	38	<390	56
Fluoranthene (ug/kg)	44	<400	<390	<400	<350	630	<390
Pyrene (ug/kg)	47	<400	<390	<400	<350	670	56
Butylbenzylphthalate (ug/kg)	<360	<400	<390	<400	<350	<390	<390
Benzo(a)anthracene (ug/kg)	<360	<400	<390	<400	<350	310	<390
Chrysene (ug/kg)	45	<400	<390	<400	<350	340	<390
bis(2-Ethylhexyl)phthalate (ug/kg)	56	52	71	<400	<350	110	70
Di-n-octylphthalate (ug/kg)	<360	<400	<390	<400	<350	<390	<390
Benzo(b)fluoranthene (ug/kg)	<360	<400	<390	<400	<350	380	<390
Benzo(k)fluoranthene (ug/kg)	<360	<400	<390	<400	<350	140	<390
Benzo(a)pyrene (ug/kg)	<360	<400	<390	<400	<350	260	<390
Indeno(1,2,3-cd)pyrene (ug/kg)	<360	<400	<390	<400	<350	210	<390
Benzo(g,h,i)perylene (ug/kg)	<360	<400	<390	<400	<350	210	<390

Notes: NA = Not Analyzed
< = Detection Limit
ug/kg= micrograms per kilogram
Data not validated by JMM

TABLE 12-4

SITE 13 - FORMER OIL REFINERY
RESULTS FOR SEMIVOLATILE ORGANIC COMPOUNDS DETECTED IN SOIL SAMPLES
(Sheet 16 of 16)

Parameter Reported	MWOR-5 07/18/90 12.5-13 ft	MWOR-5 07/18/90 14.5-15 ft
Naphthalene (ug/kg)	48	44
2-Methylnaphthalene (ug/kg)	<400	<400
Acenaphthene (ug/kg)	<400	<400
Diethylphthalate (ug/kg)	<400	<400
Fluorene (ug/kg)	<400	<400
n-Nitroso-di-phenylamine (ug/kg)	<400	<400
Pentachlorophenol (ug/kg)	<1900	<1900
Phenanthrene (ug/kg)	<400	<400
Anthracene (ug/kg)	<400	<400
Di-n-butylphthalate (ug/kg)	50	53
Fluoranthene (ug/kg)	<400	<400
Pyrene (ug/kg)	<400	<400
Butylbenzylphthalate (ug/kg)	<400	<400
Benzo(a)anthracene (ug/kg)	<400	<400
Chrysene (ug/kg)	<400	<400
bis(2-Ethylhexyl)phthalate (ug/kg)	<400	44
Di-n-octylphthalate (ug/kg)	<400	<400
Benzo(b)fluoranthene (ug/kg)	<400	<400
Benzo(k)fluoranthene (ug/kg)	<400	<400
Benzo(a)pyrene (ug/kg)	<400	<400
Indeno(1,2,3-cd)pyrene (ug/kg)	<400	<400
Benzo(g,h,i)perylene (ug/kg)	<400	<400

Notes: NA = Not Analyzed
< = Detection Limit
ug/kg= nucrogrqams per kilogram
Data not validated by JMM

TABLE 12-5

SITE 13 - FORMER OIL REFINERY
RESULTS FOR TOTAL RECOVERABLE PETROLEUM HYDROCARBONS DETECTED IN SOIL SAMPLES
(Sheet 1 of 2)

Parameter Reported	BOR-10 07/12/90 11-11.5 ft	BOR-11 07/18/90 2.5-3 ft	BOR-11 07/18/90 11-11.5 ft	BOR-12 07/18/90 3.5-4 ft	BOR-12 07/18/90 11-11.5 ft	BOR-13 07/03/90 2-2.5 ft	BOR-13 07/03/90 6.5-7 ft
TRPH (mg/kg)	17.2	3.5	22.4	7.5	24.2	3.2	91.8

Parameter Reported	BOR-15 07/18/90 2-2.5 ft	BOR-15 07/18/90 6.5-7 ft	BOR-15 07/18/90 11-11.5 ft	BOR-15 07/18/90 14-14.5 ft	BOR-16 07/23/90 2-2.5 ft	BOR-17 07/17/90 2.5-3 ft	BOR-17 07/17/90 7-7.5 ft
TRPH (mg/kg)	4690	9.6	253	3.6	56.2	1480	227

Parameter Reported	BOR-17 07/17/90 10-10.5 ft	BOR-17 07/17/90 11.5-12 ft	BOR-17R 07/17/90 10.5-11 ft	BOR-18 07/23/90 3.5-4 ft	BOR-19 07/18/90 2.5-3 ft	BOR-19 07/18/90 11-11.5 ft	BOR-21 07/18/90 2.5-3 ft
TRPH (mg/kg)	1970	257	1430	3.2	175	3660	2.6

Parameter Reported	BOR-21 07/19/90 7-7.5 ft	BOR-21 07/19/90 11.5-12 ft	BOR-22 07/23/90 7.5-8 ft	BOR-22 07/23/90 11-11.5 ft	BOR-23 07/20/90 3-3.5 ft	BOR-23 07/20/90 11-11.5 ft	BOR-25 07/20/90 11-11.5 ft
TRPH (mg/kg)	8.6	46.8	9	16.1	3.2	24.6	2.9

Notes: NA = Not Analyzed
< = Detection Limit
mg/kg = milligrams per kilogram
Data not validated by JMM

TABLE 12-5

SITE 13 - FORMER OIL REFINERY
RESULTS FOR TOTAL RECOVERABLE PETROLEUM HYDROCARBONS DETECTED IN SOIL SAMPLES
(Sheet 2 of 2)

Parameter Reported	BOR-26 07/24/90 1.5-2 ft	BOR-26 07/24/90 13-13.5 ft	BOR-27 07/20/90 2.5-3 ft	BOR-27 07/20/90 7-7.5 ft	BOR-27 07/20/90 10-10.5 ft	BOR-27 07/20/90 12.5-13 ft	BOR-7 07/05/90 2-2.5 ft
TRPH (mg/kg)	7.3	13.9	251	11.4	2.1	22.2	168

Parameter Reported	BOR-8 07/16/90 11-11.5 ft	BOR-9 07/23/90 2-2.5 ft	BOR-9 07/23/90 6.5-7 ft	BOR-9 07/23/90 11-11.5 ft	BOR-9 07/23/90 14-14.5 ft	MWOR-1 07/16/90 2.5-3 ft	MWOR-2 07/17/90 12-12.5 ft
TRPH (mg/kg)	57.9	26.8	4360	2500	2370	11.5	6.4

Parameter Reported	MWOR-3 07/17/90 7-7.5 ft	MWOR-3 07/17/90 10-10.5 ft	MWOR-4 07/18/90 2.5-3 ft	MWOR-5 07/18/90 7-7.5 ft
TRPH (mg/kg)	2.4	15.8	149	5.5

Notes: NA = Not Analyzed
< = Detection Limit
mg/kg = milligrams per kilogram
Data not validated by JMM

TABLE 12-6

SITE 13 - FORMER OIL REFINERY
RESULTS FOR PESTICIDE COMPOUNDS DETECTED IN SOIL SAMPLES

Parameter Reported	BOR-16 07/23/90 0.5-1 ft	BOR-16 07/23/90 2.5-3 ft	BOR-17 07/17/90 4-4.5 ft	BOR-18 07/23/90 14.5-15 ft	BOR-22 07/23/90 3.5-4 ft	BOR-26 07/24/90 6-6.5 ft	BOR-26 07/24/90 10.5-11 ft
beta-BHC (ug/kg)	<1.10	<1.10	<1.10	2.4	<1.10	<1.20	<12.0
4,4'-DDD (ug/kg)	<2.20	<2.10	<2.20	<2.40	<2.10	<2.40	<24.0
4,4'-DDE (ug/kg)	31	3.7	<2.20	<2.40	<2.10	<2.40	<24.0
4,4'-DDT (ug/kg)	160	<2.10	6.6	<2.40	2.8	<2.40	<24.0
Heptachlor Epoxide (ug/kg)	5.4	<1.10	<1.10	<1.20	<1.10	<1.20	<12.0
Toxaphene (ug/kg)	<54	<53	<55	<61	<53	1400	2500

Parameter Reported	BOR-26 07/24/90 13.5-14 ft	BOR-8 07/16/90 10.5-11 ft	BOR-8 07/16/90 12.5-13 ft	BOR-9 07/23/90 0.5-1 ft	MWOR-1 07/16/90 7.5-8 ft	MWOR-2 07/17/90 13-13.5 ft	MWOR-2R 07/17/90 12.5-13 ft
beta-BHC (ug/kg)	<1.20	3.5	<1.20	<1.00	<1.20	<1.20	<1.20
4,4'-DDD (ug/kg)	14	9.3	4.5	<2.10	<2.30	<2.50	<2.50
4,4'-DDE (ug/kg)	6.5	35	31	<2.10	17	<2.50	<2.50
4,4'-DDT (ug/kg)	72	12	11	2.1	14	3.2	7.4
Heptachlor Epoxide (ug/kg)	<1.20	<1.20	<1.20	<1.00	<1.20	<1.20	<1.20
Toxaphene (ug/kg)	400	<60	<60	<52	<58	<62	<62

Notes: NA = Not Analyzed
< = Detection Limit
ug/kg = micrograms per kilogram
Data not validated by JMM

TABLE 12-7

SITE 13 - FORMER OIL REFINERY
RESULTS FOR METALS DETECTED IN SOIL SAMPLES
(Sheet 1 of 15)

Parameter Reported	BOR-10 07/12/90 0.5-1 ft	BOR-10 07/12/90 4-4.5 ft	BOR-10 07/12/90 8-8.5 ft	BOR-10 07/12/90 11.5-12 ft	BOR-10 07/12/90 14.5-15 ft	BOR-11 07/18/90 0.5-1 ft	BOR-11 07/18/90 3.5-4 ft
Aluminum (mg/kg)	4400	4280	4290	5530	7530	8960	45.8
Antimony (mg/kg)	<2.10	<2.20	<2.50	<3.00	<2.30	6	4.3
Arsenic (mg/kg)	3.8	<2.60	<3.00	4.9	4.8	<2.50	<2.50
Barium (mg/kg)	84.9	21.2	48.7	51.3	67.5	103	23.6
Beryllium (mg/kg)	<0.200	<0.200	<0.200	<0.300	0.2	<0.200	<0.200
Cadmium (mg/kg)	<0.200	<0.200	<0.200	0.3	0.2	0.7	<0.200
Calcium (mg/kg)	2980	2230	5140	5900	1760	8020	3610
Chromium (mg/kg)	38.6	32.1	27.1	35.7	40.3	29.1	34.4
Cobalt (mg/kg)	4	4.2	4.5	7.4	7.4	7.8	4
Copper (mg/kg)	6.4	7.3	22.8	11.5	12.8	42.5	4.7
Iron (mg/kg)	7000	7050	7040	10600	12700	13700	7260
Lead (mg/kg)	<5.10	<5.40	<6.20	58.5	<5.80	64.2	<5.30
Magnesium (mg/kg)	1920	2160	2040	3640	3100	5600	2090
Manganese (mg/kg)	87.9	90.6	94.3	158	169	548	89.8
Nickel (mg/kg)	19	21.7	22.1	36	41.8	46	23.6
Potassium (mg/kg)	500	620	540	1100	1100	830	590
Selenium (mg/kg)	<4.30	<4.50	<5.20	<6.30	<4.80	<4.30	<4.40
Sodium (mg/kg)	174	264	423	1620	1360	493	191
Thallium (mg/kg)	<2.70	<2.80	<3.20	<3.90	<3.00	<2.70	<2.70
Titanium (mg/kg)	454	400	287	418	442	257	444
Vanadium (mg/kg)	19.2	17.6	17	22.4	23.7	27.6	18.5
Zinc (mg/kg)	19.8	22.2	34.4	92.5	36.4	64.7	23.9

Notes: NA = Not Analyzed
< = Detection Limit
mg/kg = milligrams per kilogram
Data not validated by JMM

TABLE 12-7

SITE 13 - FORMER OIL REFINERY
RESULTS FOR METALS DETECTED IN SOIL SAMPLES
(Sheet 2 of 15)

Parameter Reported	BOR-11 07/18/90 7-7.5 ft	BOR-11 07/18/90 11.5-12 ft	BOR-11 07/18/90 14.5-15 ft	BOR-12 07/18/90 0.5-1 ft	BOR-12 07/18/90 4-4.5 ft	BOR-12 07/18/90 10-10.5 ft	BOR-12 07/18/90 11.5-12 ft
Aluminum (mg/kg)	3380	5690	9190	4190	4190	11400	8710
Antimony (mg/kg)	4.2	6	6	4.8	4.5	7.4	6
Arsenic (mg/kg)	<2.90	5	3.1	<2.50	2.6	<3.00	6.1
Barium (mg/kg)	20.4	61.5	78.7	82.5	39.4	77	46.8
Beryllium (mg/kg)	<0.200	0.3	0.3	<0.200	<0.200	0.3	0.3
Cadmium (mg/kg)	<0.200	0.4	0.3	0.4	<0.200	0.4	0.4
Calcium (mg/kg)	1630	26500	1820	9970	3610	2870	5840
Chromium (mg/kg)	24.5	27.9	41.7	28.4	30.9	53.9	40.7
Cobalt (mg/kg)	3.9	9.5	5.3	4.1	3.8	7.6	10.9
Copper (mg/kg)	6.8	18.9	10.7	39.1	11.6	36	30.1
Iron (mg/kg)	5770	9810	13900	7290	6840	15200	14500
Lead (mg/kg)	<6.00	59.2	<5.90	6.7	<5.30	9.1	31
Magnesium (mg/kg)	1890	2660	3390	26.6	2250	4850	3940
Manganese (mg/kg)	70.2	202	130	159	81.3	158	184
Nickel (mg/kg)	22.2	38.9	49.6	25.9	24.7	43.6	51.4
Potassium (mg/kg)	580	960	1300	910	690	1600	1400
Selenium (mg/kg)	<5.00	<5.00	<5.00	<4.30	<4.40	<5.20	<5.20
Sodium (mg/kg)	270	1350	1240	392	494	2060	1320
Thallium (mg/kg)	<3.10	<3.10	<3.10	<2.70	<2.70	<3.20	<3.20
Titanium (mg/kg)	296	286	452	268	383	557	377
Vanadium (mg/kg)	14.2	21	23.8	15.7	16.6	32.4	27.7
Zinc (mg/kg)	22.4	79.8	42	41.9	25.5	53	73.8

Notes: NA = Not Analyzed
< = Detection Limit
mg/kg = milligrams per kilogram
Data not validated by JMM

TABLE 12-7

SITE 13 - FORMER OIL REFINERY
RESULTS FOR METALS DETECTED IN SOIL SAMPLES
(Sheet 3 of 15)

Parameter Reported	BOR-12 07/18/90 14.5-15 ft	BOR-13 07/03/90 0.5-1 ft	BOR-13 07/03/90 2.5-3 ft	BOR-13 07/03/90 7-7.5 ft	BOR-13 07/03/90 11.5-12 ft	BOR-13 07/03/90 14.5-15 ft	BOR-14 05/23/90 0-0.5 ft
Aluminum (mg/kg)	7440	4470	5030	11400	12300	12400	4710
Antimony (mg/kg)	4.6	<6.20	<6.30	<7.60	<7.20	<7.40	<6.40
Arsenic (mg/kg)	<2.90	<10.0	<10.0	<13.0	<12.0	<12.0	<11.0
Barium (mg/kg)	56.4	31	53	42	78	84	34
Beryllium (mg/kg)	<0.200	<1.00	<1.00	<1.30	<1.20	<1.20	<1.10
Cadmium (mg/kg)	0.3	<1.00	<1.00	<1.30	<1.20	<1.20	<1.10
Calcium (mg/kg)	1560	4400	3200	2900	2200	2000	2900
Chromium (mg/kg)	37.4	29	31	53	44	40	28
Cobalt (mg/kg)	3.7	<5.10	<5.30	7.5	<6.00	<6.20	<5.40
Copper (mg/kg)	20.6	9.5	5.6	10	9.3	11	36
Iron (mg/kg)	10800	8020	7600	16500	16200	15000	7770
Lead (mg/kg)	<6.00	8.8	<5.30	<6.30	<6.00	<6.20	<5.40
Magnesium (mg/kg)	2620	1800	2100	4400	3300	3300	2200
Manganese (mg/kg)	86	96	91	160	120	140	92
Nickel (mg/kg)	37.1	26	23	46	46	48	24
Potassium (mg/kg)	980	620	670	1400	1500	1500	730
Selenium (mg/kg)	<5.00	<10.0	<10.0	<13.0	<12.0	<12.0	<11.0
Sodium (mg/kg)	519	<510	<530	1900	920	710	<540
Thallium (mg/kg)	<3.10	<10.0	<10.0	<13.0	<12.0	<12.0	<11.0
Titanium (mg/kg)	430	470	490	610	554	590	440
Vanadium (mg/kg)	21.7	22	20	34	31	31	19
Zinc (mg/kg)	36.7	20	16	33	29	30	27

Notes: NA = Not Analyzed
< = Detection Limit
mg/kg = milligrams per kilogram
Data not validated by JMM

TABLE 12-7

SITE 13 - FORMER OIL REFINERY
RESULTS FOR METALS DETECTED IN SOIL SAMPLES
(Sheet 4 of 15)

Parameter Reported	BOR-14 05/23/90 4-4.5 ft	BOR-14 05/23/90 8.5-9 ft	BOR-14 05/23/90 14-14.5 ft	BOR-15 07/18/90 0.5-1 ft	BOR-15 07/18/90 2.5-3 ft	BOR-15 07/18/90 7-7.5 ft	BOR-15 07/18/90 11.5-12 ft
Aluminum (mg/kg)	5210	8900	13100	18200	4840	5890	11700
Antimony (mg/kg)	<7.50	<7.50	<7.70	8.2	5.5	5.8	4.4
Arsenic (mg/kg)	<12.0	<12.0	<13.0	2.5	<2.60	3.5	5.3
Barium (mg/kg)	28	52	110	23	30.6	48.6	61.6
Beryllium (mg/kg)	<1.20	<1.20	<1.30	<0.200	<0.200	<0.300	0.3
Cadmium (mg/kg)	<1.20	<1.20	<1.30	0.7	0.3	0.4	0.4
Calcium (mg/kg)	2200	2000	2600	9100	2390	2730	1840
Chromium (mg/kg)	28	40	50	22.8	31.1	36.7	49.8
Cobalt (mg/kg)	<6.30	<6.20	7.2	15.2	4.7	6	8.8
Copper (mg/kg)	23	22	17	160	7	10.8	11.9
Iron (mg/kg)	8420	12500	19400	28500	8480	10300	15400
Lead (mg/kg)	<6.30	<6.20	<6.40	14.1	<5.50	8.3	<5.90
Magnesium (mg/kg)	2600	2800	4000	12000	2660	3300	3880
Manganese (mg/kg)	90	140	250	456	113	127	147
Nickel (mg/kg)	26	35	62	20.1	30.2	37.5	69.1
Potassium (mg/kg)	930	740	1000	780	740	1200	1100
Selenium (mg/kg)	<12.0	<12.0	<13.0	<4.30	<4.60	<5.30	<5.00
Sodium (mg/kg)	<630	<620	900	560	176	488	2060
Thallium (mg/kg)	<12.0	<12.0	<13.0	<2.70	<2.90	<3.30	<3.10
Titanium (mg/kg)	460	520	550	544	351	431	524
Vanadium (mg/kg)	19	30	35	76.8	17.9	20.6	29.8
Zinc (mg/kg)	24	30	36	66.8	32.8	33.6	37.4

Notes: NA = Not Analyzed
< = Detection Limit
mg/kg = milligrams per kilogram
Data not validated by JMM

TABLE 12-7

SITE 13 - FORMER OIL REFINERY
RESULTS FOR METALS DETECTED IN SOIL SAMPLES
(Sheet 5 of 15)

Parameter Reported	BOR-15 07/18/90 14.5-15 ft	BOR-16 07/23/90 0.5-1 ft	BOR-16 07/23/90 2.5-3 ft	BOR-16 07/23/90 7-7.5 ft	BOR-16 07/23/90 11.5-12 ft	BOR-16 07/23/90 14.5-15 ft	BOR-17 07/17/90 2-2.5 ft
Aluminum (mg/kg)	10900	16200	7040	12600	14400	12500	2990
Antimony (mg/kg)	6.7	<6.50	<6.30	<7.20	<7.20	<7.50	<2.10
Arsenic (mg/kg)	<2.90	<11.0	<11.0	<12.0	<12.0	<12.0	<2.60
Barium (mg/kg)	72.4	290	68	99	98	84	76.2
Beryllium (mg/kg)	0.3	<1.10	<1.10	<1.20	<1.20	<1.20	<0.200
Cadmium (mg/kg)	0.4	3.5	<1.10	<1.20	<1.20	<1.20	<0.200
Calcium (mg/kg)	1670	5600	1900	2100	2900	3300	2300
Chromium (mg/kg)	59.8	47	30	44	51	53	23
Cobalt (mg/kg)	4.5	10	<5.30	6.8	9	7.9	3.8
Copper (mg/kg)	11.8	74	8.1	11	12	10	15.2
Iron (mg/kg)	13400	20300	9060	15500	17900	16800	6060
Lead (mg/kg)	<6.10	260	5.7	<6.00	<6.00	<6.30	<5.40
Magnesium (mg/kg)	3040	5100	1600	4000	5000	4500	1740
Manganese (mg/kg)	140	450	210	210	250	240	72.1
Nickel (mg/kg)	51.3	50	28	47	60	55	20.8
Potassium (mg/kg)	850	2700	800	800	1300	1300	430
Selenium (mg/kg)	<5.10	12	<11.0	<12.0	14	<12.0	<4.50
Sodium (mg/kg)	1840	<540	<530	<600	<600	<630	137
Thallium (mg/kg)	<3.20	<11.0	<11.0	<12.0	<12.0	<12.0	<2.80
Titanium (mg/kg)	293	567	390	490	644	627	245
Vanadium (mg/kg)	24.7	48	22	33	36	33	12.5
Zinc (mg/kg)	32.2	1280	25	30	35	32	27.5

Notes: NA = Not Analyzed
< = Detection Limit
mg/kg = milligrams per kilogram
Data not validated by JMM

TABLE 12-7

SITE 13 - FORMER OIL REFINERY
RESULTS FOR METALS DETECTED IN SOIL SAMPLES
(Sheet 6 of 15)

Parameter Reported	BOR-17 07/17/90 4-4.5 ft	BOR-17 07/17/90 8-8.5 ft	BOR-17 07/17/90 11-11.5 ft	BOR-17 07/17/90 14.5-15 ft	BOR-17R 07/17/90 10.5-11 ft	BOR-18 07/23/90 0.5-1 ft	BOR-18 07/23/90 4-4.5 ft
Aluminum (mg/kg)	4710	9930	11400	8990	7970	9550	5950
Antimony (mg/kg)	<2.30	4.4	3.8	4.6	4.3	<7.30	<7.10
Arsenic (mg/kg)	<2.70	<2.80	5	3.2	<2.80	20	<12.0
Barium (mg/kg)	44.9	77.3	93	84.9	79.9	76	68
Beryllium (mg/kg)	<0.200	0.3	0.3	0.3	0.3	<1.20	<1.20
Cadmium (mg/kg)	0.2	0.5	0.5	0.6	0.5	<1.20	<1.20
Calcium (mg/kg)	2220	1630	2400	2080	2020	3600	2000
Chromium (mg/kg)	28.2	36.5	56.2	47.8	44.3	34	23
Cobalt (mg/kg)	6.1	6.3	7.6	8.9	6.8	7.8	<5.90
Copper (mg/kg)	12.9	15.3	22	13	19.6	65	7.1
Iron (mg/kg)	8820	14900	17800	15400	13900	19400	7820
Lead (mg/kg)	18.6	7.1	7.4	8.1	<5.70	50	<5.90
Magnesium (mg/kg)	2190	3890	3980	4080	3190	6500	1500
Manganese (mg/kg)	96.2	109	155	254	196	280	180
Nickel (mg/kg)	27.5	44.1	59.4	58.1	48.6	43	14
Potassium (mg/kg)	770	820	790	990	623	1000	<590
Selenium (mg/kg)	<4.70	<4.90	<5.00	<5.00	<4.80	12	<12.0
Sodium (mg/kg)	135	334	377	361	370	<610	<590
Thallium (mg/kg)	<2.90	<3.00	<3.10	<3.10	<3.00	<12.0	<12.0
Titanium (mg/kg)	343	528	610	42.6	435	360	380
Vanadium (mg/kg)	18.5	27.6	31.5	26.2	25.3	32	17
Zinc (mg/kg)	25.5	39.2	59.2	37.4	39.2	91	17

Notes: NA = Not Analyzed
< = Detection Limit
mg/kg = milligrams per kilogram
Data not validated by JMM

TABLE 12-7

SITE 13 - FORMER OIL REFINERY
RESULTS FOR METALS DETECTED IN SOIL SAMPLES
(Sheet 7 of 15)

Parameter Reported	BOR-18 07/23/90 7.5-8 ft	BOR-18 07/23/90 11.5-12 ft	BOR-18 07/23/90 14.5-15 ft	BOR-19 07/18/90 0.5-1 ft	BOR-19 07/18/90 3.5-4 ft	BOR-19 07/18/90 8-8.5 ft	BOR-19 07/18/90 11.5-12 ft
Aluminum (mg/kg)	12400	10700	14200	4140	4390	10800	11200
Antimony (mg/kg)	<7.00	<7.20	<7.30	5.8	5.7	4.8	7.5
Arsenic (mg/kg)	<12.0	<12.0	<12.0	2.6	<2.80	3.5	<2.90
Barium (mg/kg)	66	81	94	46.4	26.8	109	85.9
Beryllium (mg/kg)	<1.20	<1.20	<1.20	<0.200	<0.200	0.4	0.3
Cadmium (mg/kg)	<1.20	<1.20	<1.20	0.5	0.2	0.5	0.4
Calcium (mg/kg)	1900	2300	3100	22300	1990	1960	2260
Chromium (mg/kg)	50	39	54	34	29.9	41.4	45.9
Cobalt (mg/kg)	<5.90	7.1	9.1	3.5	4.2	9.4	8.1
Copper (mg/kg)	9.1	8.4	14	10.7	7	12.1	23.5
Iron (mg/kg)	13600	12900	18600	6980	7390	14600	16600
Lead (mg/kg)	<5.90	<6.00	<6.10	<5.20	<5.80	6.7	<6.00
Magnesium (mg/kg)	3400	3500	4900	2040	2460	4140	3940
Manganese (mg/kg)	120	320	230	101	80.2	192	200
Nickel (mg/kg)	39	48	63	27.1	26.8	56.6	58.6
Potassium (mg/kg)	690	1100	1500	670	830	770	916
Selenium (mg/kg)	<12.0	<12.0	15	<4.40	<4.80	<5.00	<5.10
Sodium (mg/kg)	<590	<600	<610	467	238	431	612
Thallium (mg/kg)	<12.0	<12.0	<12.0	<2.70	<3.00	<3.10	<3.10
Titanium (mg/kg)	513	516	655	382	389	485	393
Vanadium (mg/kg)	30	25	33	17.9	16.9	30.7	27.9
Zinc (mg/kg)	23	25	35	30.2	20.9	38.7	54.6

Notes: NA = Not Analyzed
< = Detection Limit
mg/kg = nulligrams per kilogram
Data not validated by JMM

TABLE 12-7

SITE 13 - FORMER OIL REFINERY
RESULTS FOR METALS DETECTED IN SOIL SAMPLES
(Sheet 8 of 15)

Parameter Reported	BOR-19 07/18/90 14.5-15 ft	BOR-20 07/17/90 2.5-3 ft	BOR-20 07/17/90 5-5.5 ft	BOR-20 07/17/90 7-7.5 ft	BOR-20 07/17/90 11.5-12 ft	BOR-20 07/17/90 14.5-15 ft	BOR-20R 07/17/90 5.5-6 ft
Aluminum (mg/kg)	6290	4130	4300	4570	3190	4170	3480
Antimony (mg/kg)	4.5	2.6	3	4.8	3.1	3.7	2.8
Arsenic (mg/kg)	3.8	<2.50	<2.80	<2.90	<2.90	4.8	<2.90
Barium (mg/kg)	62.8	23.9	31.9	22.1	15.2	17.9	26.9
Beryllium (mg/kg)	<0.200	<0.200	<0.200	<0.200	<0.200	<0.200	<0.200
Cadmium (mg/kg)	0.3	0.3	<0.200	0.2	0.3	0.5	<0.200
Calcium (mg/kg)	1960	5370	3300	2120	1330	3570	2100
Chromium (mg/kg)	40.1	38.3	29.7	30.3	24.1	23.5	25.8
Cobalt (mg/kg)	7.1	3.1	4.1	3.9	4	4.6	3.2
Copper (mg/kg)	9.8	16	15.7	5.5	5.5	12.4	11.6
Iron (mg/kg)	11600	7440	7790	7580	6580	8270	6760
Lead (mg/kg)	<6.00	7.6	<5.80	<6.00	<6.10	8.6	<6.00
Magnesium (mg/kg)	3010	1610	2230	2150	1980	2230	1940
Manganese (mg/kg)	245	90.7	97.6	84.4	78.5	94	77
Nickel (mg/kg)	45.1	20	23.2	23.7	25.5	23.9	22.3
Potassium (mg/kg)	800	570	700	760	580	970	547
Selenium (mg/kg)	<5.00	<4.30	<4.90	<5.00	<5.10	<5.10	<5.00
Sodium (mg/kg)	380	212	317	531	461	715	359
Thallium (mg/kg)	<3.10	<2.70	<3.00	<3.10	<3.10	<3.20	<3.10
Titanium (mg/kg)	311	462	416	429	244	229	322
Vanadium (mg/kg)	21	18.6	17.3	17.1	14.1	15.5	14.8
Zinc (mg/kg)	34.3	25.3	30.4	22.1	21.5	29.2	24.2

Notes: NA = Not Analyzed
< = Detection Limit
mg/kg = milligrams per kilogram
Data not validated by JMM

TABLE 12-7

SITE 13 - FORMER OIL REFINERY
RESULTS FOR METALS DETECTED IN SOIL SAMPLES
(Sheet 9 of 15)

Parameter Reported	BOR-21 07/19/90 0.5-1 ft	BOR-21 07/19/90 3-3.5 ft	BOR-21 07/19/90 7.5-8 ft	BOR-21 07/19/90 12-12.5 ft	BOR-21 07/19/90 15-15.5 ft	BOR-22 07/23/90 0.5-1 ft	BOR-22 07/23/90 3.5-4 ft
Aluminum (mg/kg)	47.9	3400	4790	6350	7830	12300	5720
Antimony (mg/kg)	<2.10	<2.10	<2.40	<2.40	4.6	<6.90	<6.40
Arsenic (mg/kg)	<2.50	2.7	<2.90	2.9	3.3	<12.0	<11.0
Barium (mg/kg)	26.2	22.2	28	53.6	38.1	200	31
Beryllium (mg/kg)	<0.200	<0.200	<0.200	0.3	<0.200	<1.20	<1.10
Cadmium (mg/kg)	<0.200	<0.200	<0.200	<0.200	0.3	<1.20	<1.10
Calcium (mg/kg)	3090	4140	2350	1620	2230	9000	3600
Chromium (mg/kg)	52.2	23	32.7	55.7	40.7	28	31
Cobalt (mg/kg)	3.7	3.1	2.9	4.1	3.3	6.4	<5.30
Copper (mg/kg)	25.7	9.3	8.9	13.4	12.2	110	5.4
Iron (mg/kg)	7920	6030	7500	13300	13000	14400	8070
Lead (mg/kg)	8.8	6.8	8.8	6.2	8.3	7.4	<5.30
Magnesium (mg/kg)	2270	2100	2250	2980	3200	3900	2400
Manganese (mg/kg)	108	89	91.2	146	132	230	93
Nickel (mg/kg)	28.6	23.5	24.3	39.4	39.7	25	23
Potassium (mg/kg)	660	550	730	910	1000	2400	850
Selenium (mg/kg)	<4.40	<4.50	<5.00	<4.90	<5.00	<12.0	<11.0
Sodium (mg/kg)	237	184	202	500	460	<580	<530
Thallium (mg/kg)	2.7	<2.80	<3.10	<3.10	<3.10	<12.0	<11.0
Titanium (mg/kg)	431	284	441	350	504	879	627
Vanadium (mg/kg)	19.3	13.3	17.7	23.2	24	32	22
Zinc (mg/kg)	33.2	18.7	26.5	28.5	32	72	17

Notes: NA = Not Analyzed
< = Detection Limit
mg/kg = milligrams per kilogram
Data not validated by JMM

TABLE 12-7

SITE 13 - FORMER OIL REFINERY
RESULTS FOR METALS DETECTED IN SOIL SAMPLES
(Sheet 10 of 15)

Parameter Reported	BOR-22 07/23/90 8-8.5 ft	BOR-22 07/23/90 11.5-12 ft	BOR-22 07/23/90 14.5-15 ft	BOR-23 07/20/90 1-1.5 ft	BOR-23 07/20/90 3.5-4 ft	BOR-23 07/20/90 9-9.5 ft	BOR-23 07/20/90 11.5-12 ft
Aluminum (mg/kg)	5810	28800	10400	3080	5320	6440	12400
Antimony (mg/kg)	<7.70	<10.0	<7.10	2.4	<2.40	2.5	5.8
Arsenic (mg/kg)	<13.0	<17.0	<12.0	<2.50	3.1	5.6	4.9
Barium (mg/kg)	29	81	83	24.1	77.7	48.1	63.1
Beryllium (mg/kg)	<1.30	<1.70	<1.20	<0.200	<0.200	<0.200	0.3
Cadmium (mg/kg)	<1.30	<1.70	<1.20	0.3	0.5	0.5	0.6
Calcium (mg/kg)	3100	7100	2400	1720	28800	2740	3820
Chromium (mg/kg)	30	89	47	23.4	35.5	38.5	59.2
Cobalt (mg/kg)	<6.40	15	6.8	3.1	5.1	7.5	11
Copper (mg/kg)	13	36	9.5	8.6	18.6	14.2	29.7
Iron (mg/kg)	8190	37000	14400	6010	9630	12500	22400
Lead (mg/kg)	22	19	<5.90	<5.10	15.3	<6.10	18.6
Magnesium (mg/kg)	2400	10000	3700	1560	2880	4050	6130
Manganese (mg/kg)	94	500	230	95.8	213	180	310
Nickel (mg/kg)	23	91	48	21.3	32	40.4	64.6
Potassium (mg/kg)	910	3700	1600	390	830	1100	2000
Selenium (mg/kg)	<13.0	26	<12.0	<4.30	<4.90	<5.10	<5.10
Sodium (mg/kg)	<640	3300	1200	130	477	647	1670
Thallium (mg/kg)	<13.0	<17.0	<12.0	<2.70	<3.10	<3.20	<3.20
Titanium (mg/kg)	580	964	534	256	298	328	420
Vanadium (mg/kg)	22	70	28	14.8	21.2	22.1	36.1
Zinc (mg/kg)	21	94	28	24.1	38.6	45.2	70.2

Notes: NA = Not Analyzed
< = Detection Limit
mg/kg = milligrams per kilogram
Data not validated by JMM

TABLE 12-7

SITE 13 - FORMER OIL REFINERY
RESULTS FOR METALS DETECTED IN SOIL SAMPLES
(Sheet 11 of 15)

Parameter Reported	BOR-23 07/20/90 15-15.5 ft	BOR-24 07/19/90 1-1.5 ft	BOR-24 07/19/90 3-3.5 ft	BOR-24 07/24/90 7.5-8 ft	BOR-24 07/19/90 11.5-12 ft	BOR-24 07/24/90 14.5-15 ft	BOR-25 07/20/90 0.5-1 ft
Aluminum (mg/kg)	7550	4910	3780	12300	8100	8820	3470
Antimony (mg/kg)	2.6	<2.10	<2.20	4.4	4	<2.40	<2.10
Arsenic (mg/kg)	<2.90	4.9	3.3	7.1	8.1	3.9	<2.50
Barium (mg/kg)	68	43.7	64.7	114	87.6	77.9	10.6
Beryllium (mg/kg)	<0.200	<0.200	<0.200	0.4	0.3	0.3	<0.200
Cadmium (mg/kg)	0.4	0.7	<0.200	0.4	0.3	0.4	<0.200
Calcium (mg/kg)	2190	2440	1560	2290	1720	2580	2010
Chromium (mg/kg)	46.3	25.9	24.5	45.1	41.6	44.3	29.3
Cobalt (mg/kg)	7	4.7	3.6	9.5	6.5	6.9	2.8
Copper (mg/kg)	11.3	23.2	13.3	15.2	15.3	14.1	8.5
Iron (mg/kg)	14100	8930	7020	19400	14100	14300	6550
Lead (mg/kg)	<6.10	36.3	<5.50	12.4	7.5	9.8	<5.20
Magnesium (mg/kg)	3700	2740	1290	4620	3550	3870	1900
Manganese (mg/kg)	210	140	150	227	184	169	96.6
Nickel (mg/kg)	47.9	26.2	17.5	60.5	50.4	50.7	22.5
Potassium (mg/kg)	1100	760	710	800	590	942	460
Selenium (mg/kg)	<5.10	<4.50	<4.70	<4.90	<5.00	<5.10	<4.30
Sodium (mg/kg)	768	176	143	429	331	275	305
Thallium (mg/kg)	<3.20	<2.80	<2.90	<3.10	<3.10	<3.10	<2.70
Titanium (mg/kg)	440	209	250	556	325	479	295
Vanadium (mg/kg)	24.3	16.6	16.2	34	24.6	25.4	16
Zinc (mg/kg)	38	40.6	26.5	37.7	32.4	36.4	20.7

Notes: NA = Not Analyzed
< = Detection Limit
mg/kg = nulligrams per kilogram
Data not validated by JMM

TABLE 12-7

SITE 13 - FORMER OIL REFINERY
RESULTS FOR METALS DETECTED IN SOIL SAMPLES
(Sheet 12 of 15)

Parameter Reported	BOR-25 07/20/90 3.5-4 ft	BOR-25 07/20/90 7-7.5 ft	BOR-25 07/20/90 11.5-12 ft	BOR-25 07/20/90 14.5-15 ft	BOR-26 07/24/90 1-1.5 ft	BOR-26 07/24/90 2.5-3 ft	BOR-26 07/24/90 6-6.5 ft
Aluminum (mg/kg)	3470	4200	4700	7860	4210	4720	4150
Antimony (mg/kg)	<2.10	2.5	<2.40	<2.50	<6.40	<6.70	<7.20
Arsenic (mg/kg)	<2.50	3.3	<2.90	3.6	<11.0	<11.0	<12.0
Barium (mg/kg)	39.3	24.8	37	65.2	32	49	<24.0
Beryllium (mg/kg)	<0.200	<0.200	<0.200	<0.300	<1.10	<1.10	<1.20
Cadmium (mg/kg)	0.2	0.3	0.3	<0.300	<1.10	4.1	<1.20
Calcium (mg/kg)	1720	9270	1900	1940	1900	2900	1900
Chromium (mg/kg)	29.1	33.1	31.3	39.9	27	46	24
Cobalt (mg/kg)	3.2	3.8	4.2	5.8	<5.30	<5.60	<6.10
Copper (mg/kg)	65.4	7.1	13.5	13.3	<5.30	17	8.3
Iron (mg/kg)	6340	7560	8700	13800	6890	15700	7300
Lead (mg/kg)	<5.20	<5.90	8.9	<6.40	<5.30	120	<6.10
Magnesium (mg/kg)	1710	2180	2480	3760	2100	2300	2000
Manganese (mg/kg)	102	89.8	102	109	88	220	120
Nickel (mg/kg)	22.6	22.8	28	45.6	22	29	24
Potassium (mg/kg)	480	590	870	1400	630	790	630
Selenium (mg/kg)	<4.40	<5.00	<5.10	<5.30	<11.0	<11.0	<12.0
Sodium (mg/kg)	456	426	618	1350	<530	<560	<600
Thallium (mg/kg)	<2.70	<3.10	<3.20	<3.30	<11.0	<11.0	<12.0
Titanium (mg/kg)	273	451	386	446	360	300	340
Vanadium (mg/kg)	15.3	18.8	17.7	23.8	16	17	17
Zinc (mg/kg)	46.6	24.6	28.2	37.2	17	59	19

Notes: NA = Not Analyzed
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mg/kg = milligrams per kilogram
Data not validated by JMM

TABLE 12-7

SITE 13 - FORMER OIL REFINERY
RESULTS FOR METALS DETECTED IN SOIL SAMPLES
(Sheet 13 of 15)

Parameter Reported	BOR-26 07/24/90 10.5-11 ft	BOR-26 07/24/90 13.5-14 ft	BOR-27 07/20/90 1-1.5 ft	BOR-27 07/20/90 3-3.5 ft	BOR-27 07/20/90 7.5-8 ft	BOR-27 07/20/90 10.5-11 ft	BOR-27 07/20/90 13-13.5 ft
Aluminum (mg/kg)	4310	9520	3810	3770	4230	4090	14000
Antimony (mg/kg)	<7.20	<7.40	<2.10	<2.10	<2.40	<2.40	5
Arsenic (mg/kg)	<12.0	<12.0	3.7	<2.50	<2.90	<2.90	9.5
Barium (mg/kg)	<24.0	66	46.7	31.9	27.8	25.4	61.4
Beryllium (mg/kg)	<1.20	<1.20	<0.200	<0.200	<0.200	<0.200	0.4
Cadmium (mg/kg)	<1.20	<1.20	0.4	0.3	0.3	<0.200	1
Calcium (mg/kg)	1500	2000	2600	<10.0	2410	1920	5240
Chromium (mg/kg)	24	39	27.9	32.6	34.6	29.3	64.3
Cobalt (mg/kg)	<6.00	<6.10	4	3.2	3.9	3.7	12.4
Copper (mg/kg)	6.9	22	25.5	8.8	9	10.9	85.5
Iron (mg/kg)	7140	16600	6960	6750	7490	7250	25000
Lead (mg/kg)	<6.00	<6.10	<5.20	<5.20	<6.00	<6.00	14.7
Magnesium (mg/kg)	2000	4200	2100	1950	2000	2260	7620
Manganese (mg/kg)	82	130	92.8	90.1	95.9	88.3	327
Nickel (mg/kg)	22	48	22.5	21	23.9	24	76
Potassium (mg/kg)	630	1600	640	470	630	750	2400
Selenium (mg/kg)	<12.0	<12.0	<4.40	<4.40	<5.10	<5.00	<6.80
Sodium (mg/kg)	<600	1200	340	314	361	555	2420
Thallium (mg/kg)	<12.0	<12.0	<2.70	2.9	<3.10	<3.10	<4.20
Titanium (mg/kg)	280	470	381	377	380	350	366
Vanadium (mg/kg)	16	27	15.9	15.7	20	15.5	37.9
Zinc (mg/kg)	18	39	30.2	23.1	25.2	22.9	101

Notes: NA = Not Analyzed
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mg/kg = milligrams per kilogram
Data not validated by JMM

TABLE 12-7

SITE 13 - FORMER OIL REFINERY
RESULTS FOR METALS DETECTED IN SOIL SAMPLES
(Sheet 14 of 15)

Parameter Reported	BOR-6 07/05/90 0.5-1 ft	BOR-6 07/05/90 6-6.5 ft	BOR-6 07/05/90 8.5-9 ft	BOR-6 07/05/90 11.5-12 ft	BOR-6 07/05/90 14.5-15 ft	BOR-7 07/05/90 0.5-1 ft	BOR-7 07/05/90 2-2.5 ft
Aluminum (mg/kg)	3460	3960	9840	11100	10200	5040	4060
Antimony (mg/kg)	<6.30	<7.00	<7.30	<7.80	<7.30	<6.20	<6.40
Arsenic (mg/kg)	<10.0	<12.0	<12.0	<13.0	<12.0	<10.0	<11.0
Barium (mg/kg)	27	31	67	42	45	35	24
Beryllium (mg/kg)	<1.00	<1.20	<1.20	<1.30	<1.20	<1.00	<1.10
Cadmium (mg/kg)	<1.00	<1.20	<1.20	<1.30	<1.20	<1.00	<1.10
Calcium (mg/kg)	4600	870	1400	1700	2200	3000	1900
Chromium (mg/kg)	22	22	41	40	42	28	22
Cobalt (mg/kg)	<5.30	<5.80	6.1	7.4	7.1	<5.10	<5.30
Copper (mg/kg)	22	48	34	17	12	13	12
Iron (mg/kg)	5920	7570	14400	18200	14300	7900	6780
Lead (mg/kg)	<5.30	<5.80	6.1	<6.50	<6.00	<5.10	<5.30
Magnesium (mg/kg)	1800	1200	2400	4100	3500	2000	2400
Manganese (mg/kg)	75	130	130	220	160	93	85
Nickel (mg/kg)	23	16	38	61	50	23	24
Potassium (mg/kg)	<530	620	850	780	780	640	640
Selenium (mg/kg)	<10.0	<12.0	<12.0	<13.0	<12.0	<10.0	<11.0
Sodium (mg/kg)	<530	<580	910	<650	<600	<510	<530
Thallium (mg/kg)	<10.0	<12.0	<12.0	<13.0	<12.0	<10.0	<11.0
Titanium (mg/kg)	290	280	290	480	430	470	320
Vanadium (mg/kg)	15	18	32	33	25	20	15
Zinc (mg/kg)	21	47	30	35	30	18	19

Notes: NA = Not Analyzed
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mg/kg = milligrams per kilogram
Data not validated by JMM

TABLE 12-7

SITE 13 - FORMER OIL REFINERY
RESULTS FOR METALS DETECTED IN SOIL SAMPLES
(Sheet 15 of 15)

Parameter Reported	BOR-7 07/10/90 3.5-4 ft	BOR-7 07/10/90 9-9.5 ft	BOR-7 07/10/90 14.5-15 ft	BOR-8 07/16/90 1-1.5 ft	BOR-8 07/16/90 3.5-4 ft	BOR-8 07/16/90 6.5-7 ft
Aluminum (mg/kg)	4310	18800	12400	3150	3700	4130
Antimony (mg/kg)	<6.90	<7.20	<7.30	<6.40	<6.40	<7.30
Arsenic (mg/kg)	<12.0	<12.0	<12.0	<11.0	<11.0	<12.0
Barium (mg/kg)	57	110	76	<21.0	<21.0	<24.0
Beryllium (mg/kg)	<1.20	<1.20	<1.20	<1.10	<1.10	<1.20
Cadmium (mg/kg)	<1.20	<1.20	<1.20	<1.10	<1.10	<1.20
Calcium (mg/kg)	1200	2100	2100	2400	2100	1800
Chromium (mg/kg)	23	72	40	20	26	23
Cobalt (mg/kg)	<5.70	7.2	<6.10	<5.30	<5.30	<6.10
Copper (mg/kg)	7.4	26	20	15	9.1	6.7
Iron (mg/kg)	7760	22100	14000	5810	6330	7190
Lead (mg/kg)	<5.70	9.6	6.5	<5.30	<5.30	<6.10
Magnesium (mg/kg)	1500	3600	3000	1800	1800	2300
Manganese (mg/kg)	76	190	150	69	79	88
Nickel (mg/kg)	16	61	45	20	19	24
Potassium (mg/kg)	790	2300	1100	<530	<530	720
Selenium (mg/kg)	<12.0	<12.0	<12.0	<11.0	<11.0	<12.0
Sodium (mg/kg)	<570	990	<610	<530	<530	<610
Thallium (mg/kg)	<12.0	<12.0	<12.0	<11.0	<11.0	<12.0
Titanium (mg/kg)	290	653	590	300	410	360
Vanadium (mg/kg)	18	46	27	14	17	17
Zinc (mg/kg)	16	42	38	18	16	17

Notes: NA = Not Analyzed
< = Detection Limit
mg/kg = milligrams per kilogram
Data not validated by JMM

TABLE 12-8

SITE 13 - FORMER OIL REFINERY
RESULTS FOR GENERAL CHEMICAL CHARACTERISTICS IN SOIL SAMPLES
(Sheet 1 of 5)

Parameter Reported	BOR-10 07/12/90 1-1.5 ft	BOR-11 07/18/90 4-4.5 ft	BOR-12 07/18/90 8-8.5 ft	BOR-13 07/03/90 1-1.5 ft	BOR-14 05/23/90 0.5-1 ft	BOR-14 05/23/90 1-1.5 ft	BOR-14 05/23/90 4.5-5 ft
Miscellaneous Measurements							
Ash (%)	99.3	99.3	99.3	95.9	NA	96.25	77.06
Chloride (mg/kg)	6.5	5.5	69.9	18.5	NA	<1.10	<1.30
Nitrate (as Nitrogen) (mg/kg)	<0.160	0.18	0.14	<0.100	NA	<1.10	<1.30
Sulfate (mg/kg)	8.2	10.9	48.4	5	NA	1.5	4.3
Total Kjeldahl Nitrogen (mg/kg)	72.8	146	162	78.4	NA	350	250
Total Phosphorus (mg/kg)	180	232	472	148	NA	NA	NA
Total Organic Carbon							
Total Organic Carbon (mg/kg)	316	416	416	434	130	NA	3000

	BOR-10 07/12/90 4-4.5 ft	BOR-11 07/18/90 3.5-4 ft	BOR-12 07/18/90 4-4.5 ft	BOR-13 07/03/90 2.5-3 ft	BOR-14 05/23/90 0-0.5 ft	BOR-14 05/23/90 4-4.5 ft	BOR-14 05/23/90 8.5-9 ft
Characteristic Measurements							
pH (Units)	9.9	9.1	10	8.8	9	9	7.5

Notes: NA = Not Analyzed
< = Detection Limit
mg/kg = milligrams per kilogram
Data not validated by JMM

TABLE 12-8

SITE 13 - FORMER OIL REFINERY
RESULTS FOR GENERAL CHEMICAL CHARACTERISTICS IN SOIL SAMPLES
(Sheet 2 of 5)

Parameter Reported	BOR-14 05/23/90 9-9.5 ft	BOR-14 05/23/90 14.5-15 ft	BOR-15 07/18/90 4-4.5 ft	BOR-16 07/23/90 3.5-4 ft	BOR-17 07/17/90 5-5.5 ft	BOR-18 07/23/90 2.5-3 ft	BOR-19 07/18/90 4-4.5 ft
Miscellaneous Measurements							
Ash (%)	80.44	<83	98.8	98.2	98.9	98.5	99.3
Chloride (mg/kg)	4.4	8.1	185	17.5	3.8	11.3	16.4
Nitrate (as Nitrogen) (mg/kg)	<1.20	<1.20	3.42	<0.120	<0.100	0.12	0.38
Sulfate (mg/kg)	6.6	6.7	28.2	45.2	55.1	5	54.9
Total Kjeldahl Nitrogen (mg/kg)	160	120	174	465	297	202	90
Total Phosphorus (mg/kg)	NA	NA	736	1300	340	1030	571
Total Organic Carbon							
Total Organic Carbon (mg/kg)	580	120	1140	4150	3530	601	416

	BOR-14 05/23/90 14-14.5 ft	BOR-15 07/18/90 2.5-3 ft	BOR-16 07/23/90 2.5-3 ft	BOR-17 07/17/90 4-4.5 ft	BOR-18 07/23/90 4-4.5 ft	BOR-19 07/18/90 3.5-4 ft	BOR-20 07/17/90 5-5.5 ft
Characteristic Measurements							
pH (Units)	7.5	8.7	6.2	8.2	7	9.3	9.4

Notes: NA = Not Analyzed
< = Detection Limit
mg/kg = milligrams per kilogram
Data not validated by JMM

TABLE 12-8

SITE 13 - FORMER OIL REFINERY
RESULTS FOR GENERAL CHEMICAL CHARACTERISTICS IN SOIL SAMPLES
(Sheet 3 of 5)

Parameter Reported	BOR-20 07/17/90 4.5-5 ft	BOR-21 07/19/90 4-4.5 ft	BOR-22 07/23/90 4-4.5 ft	BOR-23 07/23/90 4-4.5 ft	BOR-24 07/19/90 4-4.5 ft	BOR-25 07/20/90 4-4.5 ft	BOR-26 07/24/90 4-4.5 ft
Miscellaneous Measurements							
Ash (%)	99.2	99.2	98.4	98.7	98.8	99.3	99.3
Chloride (mg/kg)	4.6	6.6	16.6	14.4	5.8	5.8	4.5
Nitrate (as Nitrogen) (mg/kg)	0.37	1.32	0.98	0.23	1.79	0.15	<0.110
Sulfate (mg/kg)	15.7	30.2	17.1	31.9	13.9	6.4	4.4
Total Kjeldahl Nitrogen (mg/kg)	146	101	84	207	207	78	72.8
Total Phosphorus (mg/kg)	232	232	489	436	679	241	462
Total Organic Carbon							
Total Organic Carbon (mg/kg)	156	364	273	819	416	109	271

	BOR-20R 07/17/90 5.5-6 ft	BOR-21 07/19/90 3-3.5 ft	BOR-22 07/23/90 3.5-4 ft	BOR-23 07/20/90 3.5-4 ft	BOR-24 07/19/90 3-3.5 ft	BOR-25 07/20/90 3.5-4 ft	BOR-26 07/24/90 2.5-3 ft
Characteristic Measurements							
pH (Units)	9.6	9.8	9.6	9.3	8.6	9.4	6.4

Notes: NA = Not Analyzed
< = Detection Limit
mg/kg = milligrams per kilogram
Data not validated by JMM

TABLE 12-8

SITE 13 - FORMER OIL REFINERY
RESULTS FOR GENERAL CHEMICAL CHARACTERISTICS IN SOIL SAMPLES
(Sheet 4 of 5)

Parameter Reported	BOR-27 07/20/90 4-4.5 ft	BOR-6 07/05/90 2-2.5 ft	BOR-7 07/05/90 6-6.5 ft	BOR-8 07/16/90 2.5-3 ft	BOR-8 07/16/90 3-3.5 ft	BOR-9 07/23/90 4-4.5 ft	MWOR-1 05/23/90 0.5-1 ft
Miscellaneous Measurements							
Ash (%)	99.4	95.24	81.89	99.3	99.3	94.4	NA
Chloride (mg/kg)	5.7	5.6	15.6	5.2	6.2	20.9	NA
Nitrate (as Nitrogen) (mg/kg)	0.18	1.12	0.36	<0.160	<0.160	<0.120	NA
Sulfate (mg/kg)	10.5	<5.20	35.9	<5.20	<5.30	123	NA
Total Kjeldahl Nitrogen (mg/kg)	95	78.4	218	151	151	1270	NA
Total Phosphorus (mg/kg)	555	301	467	455	143	2000	NA
Total Organic Carbon							
Total Organic Carbon (mg/kg)	218	364	505	263	631	16800	130

	BOR-27 07/20/90 3-3.5 ft	BOR-6 07/05/90 11.5-12 ft	BOR-7 07/05/90 2-2.5 ft	BOR-8 07/16/90 3.5-4 ft	BOR-9 07/23/90 2.5-3 ft	MWOR-1 07/16/90 3-3.5 ft	MWOR-2 07/17/90 4-4.5 ft
Characteristic Measurements							
pH (Units)	9.2	7.4	9.5	9.9	8.7	8.9	9.2

Notes: NA = Not Analyzed
< = Detection Limit
mg/kg = milligrams per kilogram
Data not validated by JMM

TABLE 12-8

SITE 13 - FORMER OIL REFINERY
RESULTS FOR GENERAL CHEMICAL CHARACTERISTICS IN SOIL SAMPLES
(Sheet 5 of 5)

Parameter Reported	MWOR-1 07/16/90 4-4.5 ft	MWOR-1 07/16/90 14.5-15 ft	MWOR-2 07/16/90 5-5.5 ft	MWOR-3 07/17/90 5-5.5 ft	MWOR-4 07/19/90 4-4.5 ft	MWOR-5 07/19/90 1.5-2 ft
Miscellaneous Measurements						
Ash (%)	99	NA	99.2	98.7	99	98.3
Chloride (mg/kg)	8.5	NA	3.9	51.2	6	41
Nitrate (as Nitrogen) (mg/kg)	<0.180	NA	0.21	<0.100	1.26	0.21
Sulfate (mg/kg)	13.8	NA	10.9	30.8	6.5	1040
Total Kjeldahl Nitrogen (mg/kg)	129	NA	95	174	168	202
Total Phosphorus (mg/kg)	340	NA	372	480	785	538
Total Organic Carbon						
Total Organic Carbon (mg/kg)	316	120	416	364	727	1820

	MWOR-3 07/17/90 4-4.5 ft	MWOR-3 07/17/90 5-5.5 ft	MWOR-4 07/19/90 3-3.5 ft	MWOR-5 07/19/90 8.5-9 ft
Characteristic Measurements				
pH (Units)	8.9	9.6	7.7	9.2

Notes: NA = Not Analyzed
< = Detection Limit
mg/kg = milligrams per kilogram
Data not validated by JMM

TABLE 12-9

SITE 13 - FORMER OIL REFINERY
RESULTS FOR VOLATILE ORGANIC COMPOUNDS DETECTED IN GROUNDWATER SAMPLES

Parameter Reported	220 08/28/90 0-0 ft	MW-1 10/15/90 0-0 ft	MWOR-1 08/24/90 0-0 ft	MWOR-3 08/27/90 0-0 ft	MWOR-4 08/27/90 0-0 ft
Methylene Chloride (ug/L)	5	<25.0	10	17	5
Benzene (ug/L)	<5.00	400	<5.00	<5.00	<5.00
Ethylbenzene (ug/L)	<5.00	34	<5.00	<5.00	<5.00
Xylenes (total) (ug/L)	<5.00	32	<5.00	<5.00	<5.00

Notes: 200-series numbers as well or boring name indicates a travel blank
NA = Not Analyzed
< = Detection Limit
ug/L = micrograms per liter
Data not validated by JMM

TABLE 12-10

SITE 13 - FORMER OIL REFINERY
RESULTS FOR SEMIVOLATILE ORGANIC COMPOUNDS, TOTAL RECOVERABLE PETROLEUM HYDROCARBONS, AND PESTICIDE COMPOUNDS DETECTED IN GROUNDWATER SAMPLES

Parameter Reported	MW-1 10/15/90 0-0 ft	MWOR-1 08/24/90 0-0 ft	MWOR-2 08/27/90 0-0 ft
Semivolatile Compounds			
Naphthalene (ug/L)	23	NA	NA
2-Methylnaphthalene (ug/L)	16	NA	NA
bis(2-Ethylhexyl)phthalate (ug/L)	11	NA	NA
Hydrocarbon Compounds			
TRPH (mg/L)	21	NA	0.08
Pesticide Compounds			
4,4'-DDT (ug/L)	0.025	0.08	NA

Notes: NA = Not Analyzed
< = Detection Limit
ug/L = micrograms per liter
Data not validated by JMM

TABLE 12-11

SITE 13 - FORMER OIL REFINERY
RESULTS FOR METALS DETECTED IN GROUNDWATER SAMPLES

Parameter Reported	MW-1 10/15/90 0-0 ft	MWOR-1 08/24/90 0-0 ft	MWOR-2 08/27/90 0-0 ft	MWOR-3 08/27/90 0-0 ft	MWOR-4 08/27/90 0-0 ft	MWOR-5 08/28/90 0-0 ft
Aluminum (mg/L)	50	46	184	386	244	223
Arsenic (mg/L)	<0.200	<0.200	0.077	<0.050	<0.050	<0.050
Barium (mg/L)	0.66	0.37	0.88	1.9	1.7	1.3
Beryllium (mg/L)	<0.005	<0.005	0.0054	0.0084	0.0055	0.0056
Calcium (mg/L)	82	359	83	113	61	23
Chromium (mg/L)	0.15	0.13	0.6	1.1	0.72	0.65
Cobalt (mg/L)	<0.050	<0.050	0.14	0.25	0.17	0.13
Copper (mg/L)	0.051	0.042	0.26	0.32	0.19	0.25
Iron (mg/L)	92	59	266	465	300	296
Lead (mg/L)	<0.050	<0.050	0.18	0.054	<0.050	0.055
Magnesium (mg/L)	81	98	94	128	80	81
Manganese (mg/L)	2.7	12	3.4	11	4.8	5.4
Nickel (mg/L)	0.19	0.19	0.71	1.7	0.92	0.8
Potassium (mg/L)	25	14	34	43	16	35
Selenium (mg/L)	<0.100	<0.200	0.097	0.18	0.12	0.12
Sodium (mg/L)	506	390	353	172	47	97
Titanium (mg/L)	1.3	1.4	4.7	7.3	5.6	5.4
Vanadium (mg/L)	0.13	0.11	0.55	0.76	0.55	0.51
Zinc (mg/L)	0.18	0.12	0.68	0.86	0.56	0.63

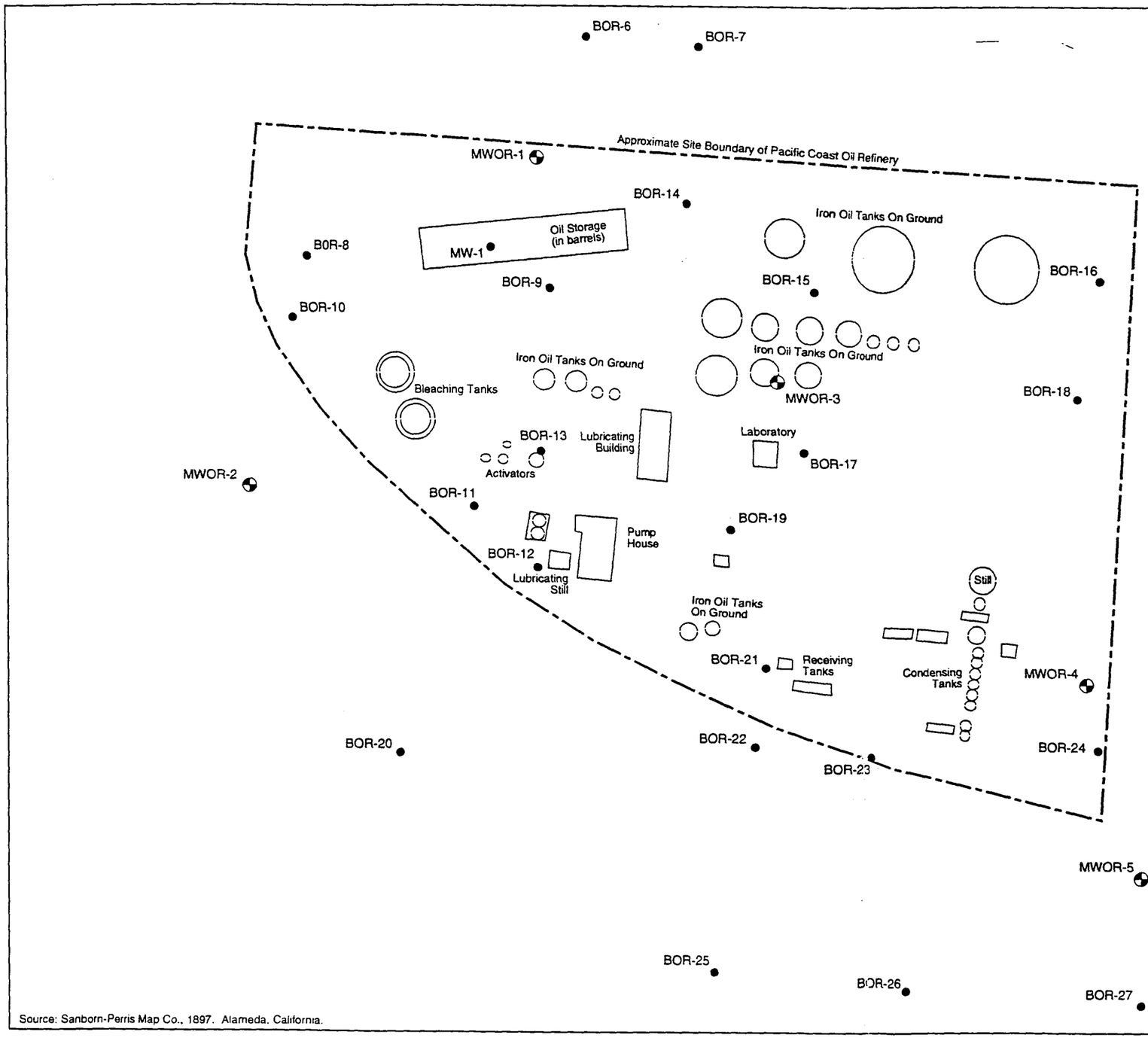
Notes: NA = Not Analyzed
< = Detection Limit
mg/L = milligrams per liter
Data not validated by JMM

TABLE 12-12

SITE 13 - FORMER OIL REFINERY
RESULTS FOR GENERAL CHEMICAL CHARACTERISTICS IN GROUNDWATER SAMPLES

Parameter Reported	MW-1 10/15/90 0-0 ft	MWOR-1 08/24/90 0-0 ft	MWOR-2 08/27/90 0-0 ft	MWOR-3 08/27/90 0-0 ft	MWOR-4 08/27/90 0-0 ft	MWOR-5 08/28/90 0-0 ft
Miscellaneous Measurements						
Total Dissolved Solids (mg/L)	1820	3160	1380	880	620	780
Total Organic Carbon						
Total Organic Carbon (mg/L)	67.6	21.3	23.2	15.1	7.5	10
Characteristic Measurements						
Dissolved Oxygen (mg/L)	1.6	5.2	3.4	6.2	3.6	4.6
pH (Units)	7	6.8	7.8	7.4	6.7	7.2
Specific Conductance (umhos/cm)	2580	4020	2320	1410	470	540

Notes: NA = Not Analyzed
< = Detection Limit
mg/L = milligrams per liter
umhos/cm = micromhos per centimeter
Data not validated by JMM



Source: Sanborn-Perris Map Co., 1897. Alameda, California.

LEGEND

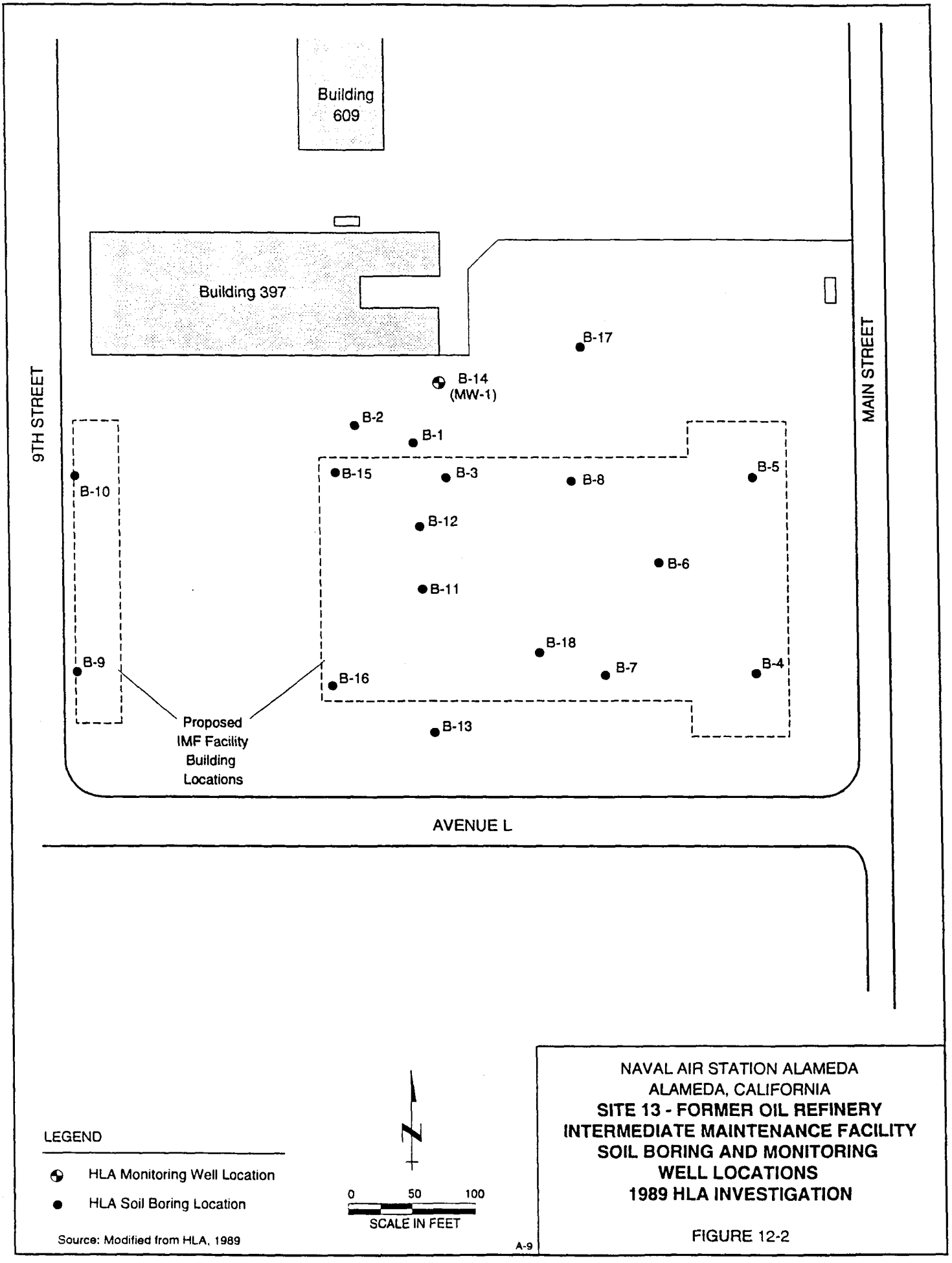
- ● Canonie Soil Boring Location
- ◒ Canonie Monitoring Well Location

NOTE:
Boring and monitoring well locations were obtained from a base map provided by Canonie Environmental, Inc. The individual locations were digitized onto a base map CAD file provided by NAS Alameda.

0 80 160
SCALE IN FEET

NAVAL AIR STATION ALAMEDA
ALAMEDA, CALIFORNIA
SITE 13 - FORMER OIL REFINERY
HISTORICAL STRUCTURES
PACIFIC COAST OIL REFINERY CIRCA 1897

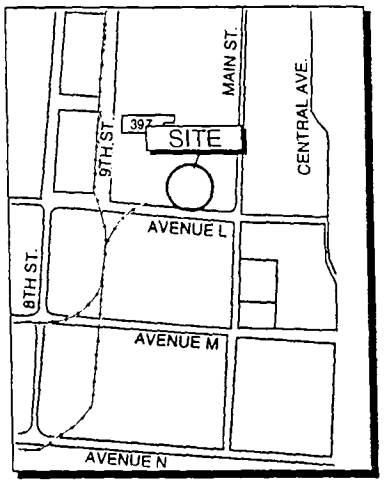
FIGURE 12-1



NAVAL AIR STATION ALAMEDA
ALAMEDA, CALIFORNIA

SITE 13 - FORMER OIL REFINERY INTERMEDIATE MAINTENANCE FACILITY SOIL BORING AND MONITORING WELL LOCATIONS 1989 HLA INVESTIGATION

FIGURE 12-2



B-IMF-06

B-IMF-03

B-IMF-09

B-7

B-IMF-01

M-IMF-02

B-IMF-08

B-IMF-10

B-IMF-02

B-IMF-07

B-IMF-11

M-IMF-01

B-IMF-04

B-IMF-08

AVENUE L

LEGEND

- Monitoring Well Location, Phase I Investigation
- Monitoring Well Location, Phase III Investigation
- HLA Soil Boring Location
- Soil Boring Location, Phase I Investigation
- Soil Boring Location, Phase III Investigation

0 15 30

SCALE IN FEET

A-9

NAVAL AIR STATION ALAMEDA
ALAMEDA, CALIFORNIA

SITE 13 - FORMER OIL REFINERY INTERMEDIATE MAINTENANCE FACILITY SOIL BORING AND MONITORING WELL LOCATIONS PHASES I AND III INVESTIGATIONS

FIGURE 12-3

LEGEND

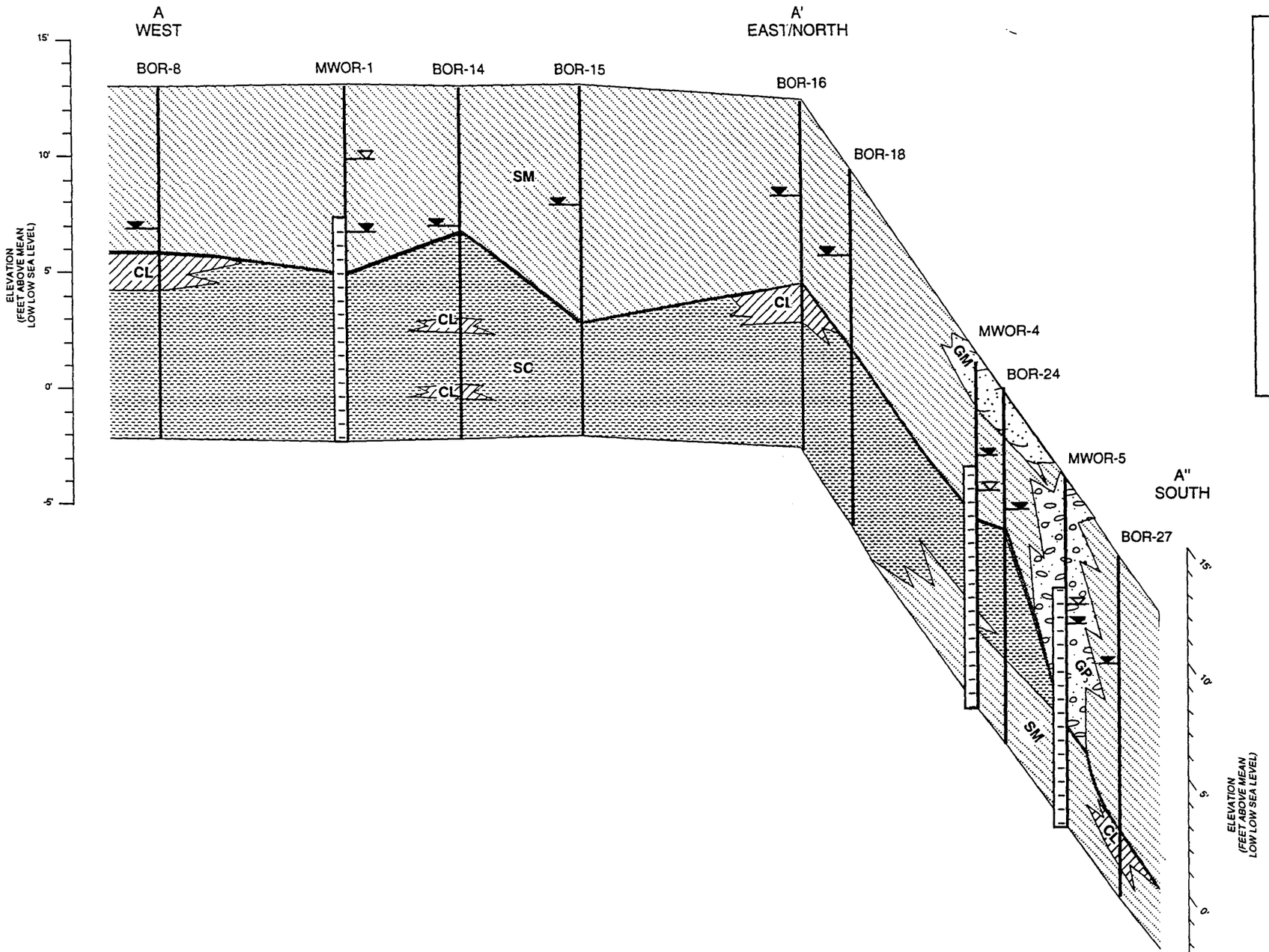
- Canonie Soil Boring Location
- Canonie Monitoring Well Location
- Fence
- Sanitary Sewer Line
- Storm Sewer Line
- Railroad
- Manhole
- Catch Basin

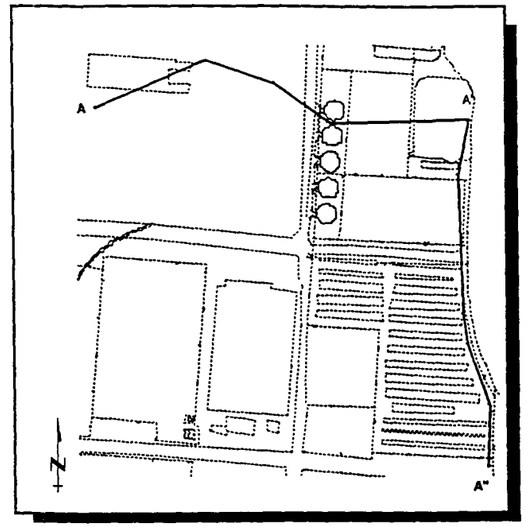
NOTE:
Boring and monitoring well locations were obtained from a base map provided by Canonie Environmental, Inc. The individual locations were digitized onto a base map CAD file provided by NAS Alameda.

0 80 160
SCALE IN FEET

NAVAL AIR STATION ALAMEDA
ALAMEDA, CALIFORNIA
SITE 13 - FORMER OIL REFINERY
CANONIE BORING AND MONITORING WELL LOCATIONS

FIGURE 12-4





5'
0'
200'

Scale in Feet
Vertical Exaggeration 40:1

LEGEND

- GP Gravelly Sand
- SP Sand
- SM Silty Sand
- SC Clayey Sand
- CL Clay
- AS Asphalt
- GM Silty Gravel
- Approximate Fill/Native Sediment Interface
- Water Level During Water Sampling
- First Water During Drilling
- Monitoring Well
- Screened Interval

This cross section is based on logs of wells and borings drilled and logged by Canonie Environmental, Inc. All water levels were measured by Canonie Environmental, Inc.

NAVAL AIR STATION ALAMEDA
ALAMEDA, CALIFORNIA
SITE 13 - FORMER OIL REFINERY
GEOLOGIC FENCE DIAGRAM A-A'-A"

FIGURE 12-5

LEGEND

- Canonie Soil Boring Location
- Canonie Monitoring Well Location
- Fence
- Sanitary Sewer Line
- Storm Sewer Line
- Railroad
- Manhole
- Catch Basin

BOR-6

(µg/kg) Depth (ft)	5.5-6	8-8.5	11-11.5	14-14.5
Methylene Chloride	21	19	22	11
Acetone	6	8	7	29

BOR-7

(µg/kg) Depth (ft)	2.5-3	4-4.5	8.5-9	13.5-14
Methylene Chloride	31	12	14	14
Acetone	7	8	6	9

BOR-8

(µg/kg) Depth (ft)	4-4.5	7-7.5	11-11.5	14-14.5
Methylene Chloride	15	15	11	8
Acetone	23	14	21	32

MWOR-1

(µg/kg) Depth (ft)	7-7.5	11.5-12	14.5-15
Methylene Chloride	14	14	11
Acetone	16	7	13

BOR-14

(µg/kg) Depth (ft)	6-6.5	8-8.5	13-13.5
Methylene Chloride	18	13	14

BOR-15

(µg/kg) Depth (ft)	6.5-7	11-11.5	14-14.5
Methylene Chloride	40	31	26
Acetone	26	39	28

BOR-16

(µg/kg) Depth (ft)	2-2.5	6.5-7	11-11.5	14-14.5
Methylene Chloride	12	16	11	14
Acetone	<10.0	18	<12.0	<12.0

BOR-9

(µg/kg) Depth (ft)	2-2.5	6.5-7	11-11.5	14-14.5
Methylene Chloride	14	2800	2000	3300

BOR-18

(µg/kg) Depth (ft)	3.5-4	7-7.5	11-11.5	14-14.5
Methylene Chloride	16	16	11	15
Acetone	25	<13.0	<12.0	12

BOR-10

(µg/kg) Depth (ft)	3.5-4	7-7.5	11-11.5	14-14.5
Methylene Chloride	10	11	19	10
Acetone	18	38	71	18
Carbon Disulfide	<5.00	<6.00	14	<6.00

MWOR-3

(µg/kg) Depth (ft)	2.5-3	7-7.5	10-10.5	11.5-12
Methylene Chloride	5	14	15	13
Acetone	7	28	24	42

BOR-13

(µg/kg) Depth (ft)	2-2.5	6.5-7	11-11.5	14-14.5
Methylene Chloride	15	17	27	29
Acetone	<10.0	17	25	<12.0

MWOR-2

(µg/kg) Depth (ft)	2.5-3	7-7.5	10-10.5	12-12.5
Methylene Chloride	6	23	22	21
Acetone	6	16	16	26
Carbon Disulfide	<5.00	<6.00	<6.00	2

BOR-17

(µg/kg) Depth (ft)	7-7.5	11.5-12
Methylene Chloride	20	15
Acetone	50	70

BOR-11

(µg/kg) Depth (ft)	2.5-3	6.5-7	11-11.5	14-14.5
Methylene Chloride	10	31	49	17
Acetone	18	10	43	9
Carbon Disulfide	<5.00	<6.00	3	<6.00

BOR-23

(µg/kg) Depth (ft)	3-3.5	8.5-9	11-11.5	14.5-15
Methylene Chloride	7	7	22	12
Acetone	11	45	85	17
Carbon Disulfide	<5.00	<6.00	11	<6.00

MWOR-4

(µg/kg) Depth (ft)	2.5-3	6.5-7	10-10.5	14-14.5
Methylene Chloride	7	34	11	18
Acetone	22	48	30	21

BOR-12

(µg/kg) Depth (ft)	3.5-4	8.5-9	11-11.5	14-14.5
Methylene Chloride	10	45	160	63
Acetone	17	37	110	38
Carbon Disulfide	<5.00	<6.00	13	<6.00

BOR-19

(µg/kg) Depth (ft)	2.5-3	7-7.5	14-14.5
Methylene Chloride	12	25	8
Acetone	29	79	45

BOR-24

(µg/kg) Depth (ft)	2.5-3	7-7.5	11-11.5	14-14.5
Methylene Chloride	14	6	7	17
Acetone	8	33	36	11

BOR-21

(µg/kg) Depth (ft)	2.5-3	7-7.5	14-14.5
Methylene Chloride	5	12	18
Acetone	53	35	19

BOR-20

(µg/kg) Depth (ft)	3-3.5	6-6.5	10-10.5	11.5-12
Methylene Chloride	8	19	20	15
Acetone	13	12	15	13
Carbon Disulfide	<5.00	<6.00	<6.00	2

BOR-22

(µg/kg) Depth (ft)	2.5-3	7.5-8	11-11.5	14-14.5
Methylene Chloride	19	14	28	15

MWOR-5

(µg/kg) Depth (ft)	7-7.5	10-10.5	12.5-13	14.5-15
Methylene Chloride	10	10	13	13
Acetone	18	21	11	27

BOR-26

(µg/kg) Depth (ft)	5.5-6	10-10.5	13-13.5
Methylene Chloride	5	6	5
Acetone	11	27	19

BOR-27

(µg/kg) Depth (ft)	2.5-3	7-7.5	10-10.5	12.5-13
Methylene Chloride	10	13	15	32
Acetone	18	21	32	140
Carbon Disulfide	<5.00	<6.00	<6.00	4

BOR-25

(µg/kg) Depth (ft)	2.5-3	6.5-7	11-11.5	14-14.5
Methylene Chloride	14	8	9	14
Acetone	63	38	15	24

NOTES:
Boring and monitoring well locations were obtained from a base map provided by Canonie Environmental, Inc. The individual locations were digitized onto a base map CAD file provided by NAS Alameda.

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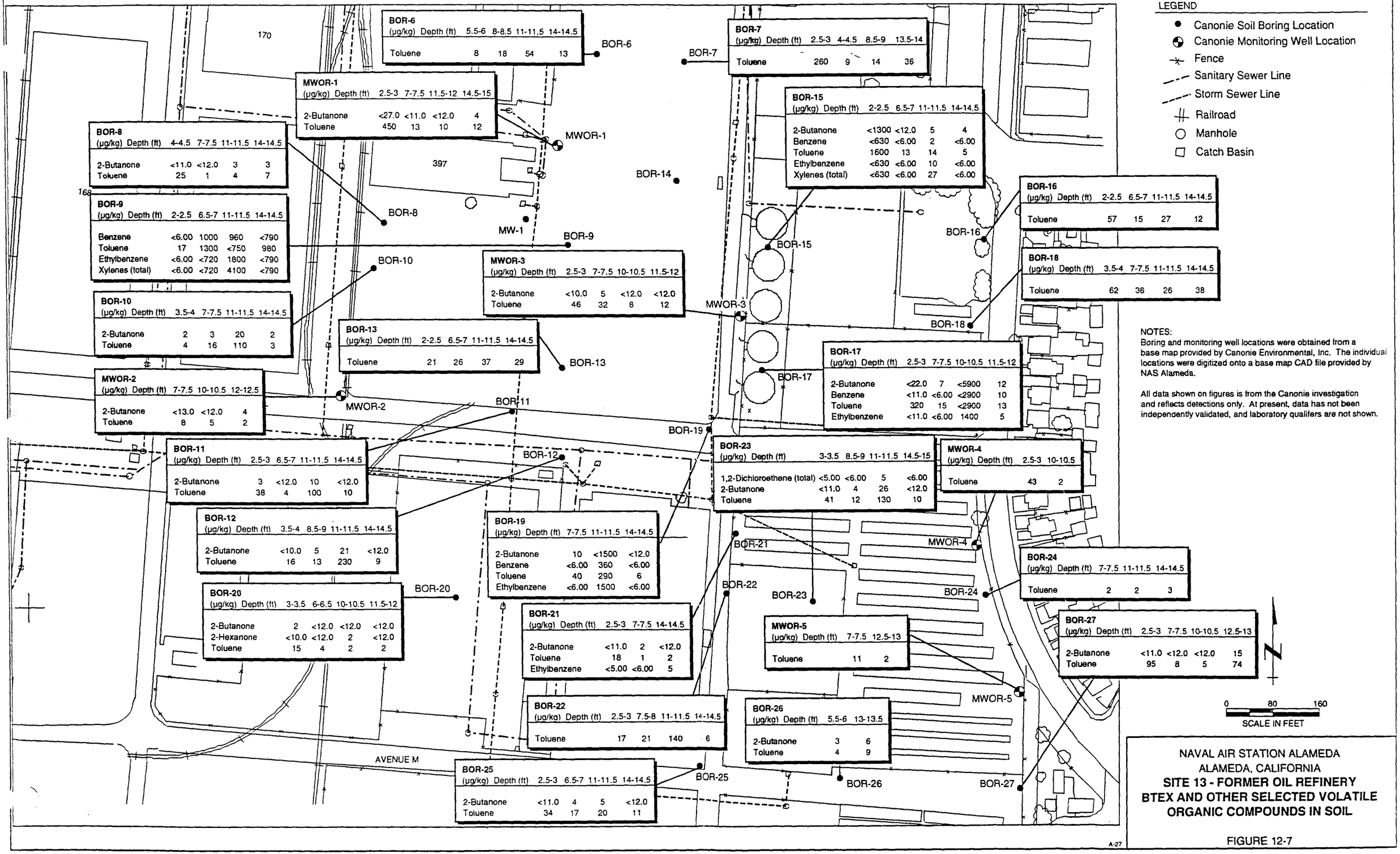
0 80 160
SCALE IN FEET

NAVAL AIR STATION ALAMEDA
ALAMEDA, CALIFORNIA
SITE 13 - FORMER OIL REFINERY
SELECTED VOLATILE ORGANIC COMPOUNDS IN SOIL

FIGURE 12-6

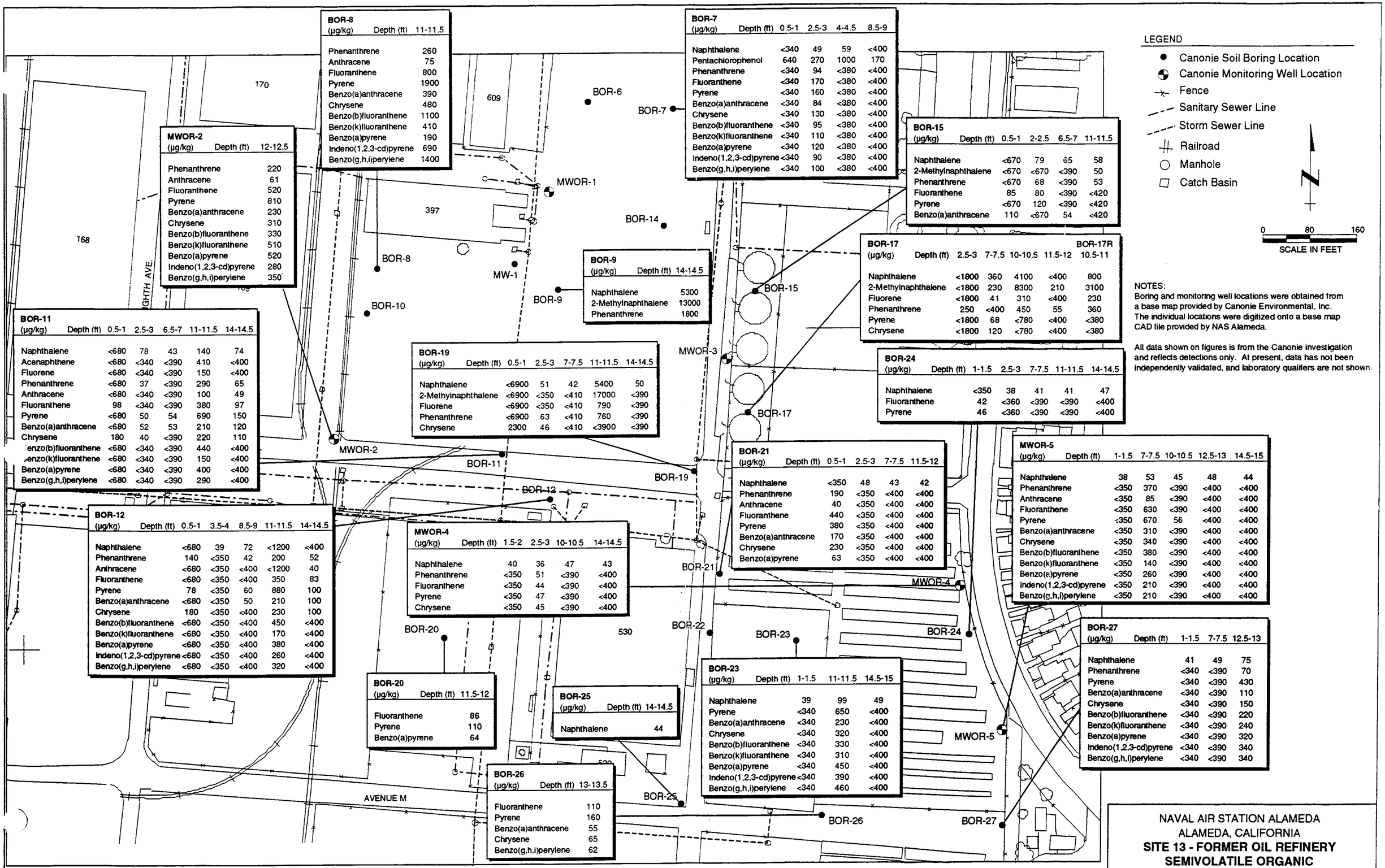
A-27



NAVAL AIR STATION ALAMEDA
ALAMEDA, CALIFORNIA

SITE 13 - FORMER OIL REFINERY
BTEX AND OTHER SELECTED VOLATILE ORGANIC COMPOUNDS IN SOIL

FIGURE 12-7



BOR-8

(µg/kg)	Depth (ft)	11-11.5
Phenanthrene		260
Anthracene		75
Fluoranthene		800
Pyrene		1900
Benzo(a)anthracene		390
Chrysene		480
Benzo(b)fluoranthene		1100
Benzo(k)fluoranthene		410
Benzo(a)pyrene		190
Indeno(1,2,3-cd)pyrene		690
Benzo(g,h,i)perylene		1400

MWOR-2

(µg/kg)	Depth (ft)	12-12.5
Phenanthrene		220
Anthracene		61
Fluoranthene		520
Pyrene		810
Benzo(a)anthracene		230
Chrysene		310
Benzo(b)fluoranthene		330
Benzo(k)fluoranthene		510
Benzo(a)pyrene		520
Indeno(1,2,3-cd)pyrene		280
Benzo(g,h,i)perylene		350

BOR-7

(µg/kg)	Depth (ft)	0.5-1	2.5-3	4-4.5	8.5-9
Naphthalene		<340	49	59	<400
Pentachlorophenol		640	270	1000	170
Phenanthrene		<340	94	<380	<400
Fluoranthene		<340	170	<380	<400
Pyrene		<340	160	<380	<400
Benzo(a)anthracene		<340	84	<380	<400
Chrysene		<340	130	<380	<400
Benzo(b)fluoranthene		<340	95	<380	<400
Benzo(k)fluoranthene		<340	110	<380	<400
Benzo(a)pyrene		<340	120	<380	<400
Indeno(1,2,3-cd)pyrene		<340	90	<380	<400
Benzo(g,h,i)perylene		<340	100	<380	<400

BOR-15

(µg/kg)	Depth (ft)	0.5-1	2-2.5	6.5-7	11-11.5
Naphthalene		<670	79	65	58
2-Methylnaphthalene		<670	<670	<390	50
Phenanthrene		<670	68	<390	53
Fluoranthene		85	80	<390	<420
Pyrene		<670	120	<390	<420
Benzo(a)anthracene		110	<670	54	<420

BOR-9

(µg/kg)	Depth (ft)	14-14.5
Naphthalene		5300
2-Methylnaphthalene		13000
Phenanthrene		1800

BOR-17

(µg/kg)	Depth (ft)	2.5-3	7-7.5	10-10.5	11.5-12	BOR-17R 10.5-11
Naphthalene		<1800	360	4100	<400	800
2-Methylnaphthalene		<1800	230	8300	210	3100
Fluorene		<1800	41	310	<400	230
Phenanthrene		250	<400	450	55	360
Pyrene		<1800	68	<780	<400	<380
Chrysene		<1800	120	<780	<400	<380

BOR-11

(µg/kg)	Depth (ft)	0.5-1	2.5-3	6.5-7	11-11.5	14-14.5
Naphthalene		<680	78	43	140	74
Acenaphthene		<680	<340	<390	410	<400
Fluorene		<680	<340	<390	150	<400
Phenanthrene		<680	37	<390	290	65
Anthracene		<680	<340	<390	100	49
Fluoranthene		98	<340	<390	380	97
Pyrene		<680	50	54	690	150
Benzo(a)anthracene		<680	52	53	210	120
Chrysene		180	40	<390	220	110
Benzo(b)fluoranthene		<680	<340	<390	440	<400
Benzo(k)fluoranthene		<680	<340	<390	150	<400
Benzo(a)pyrene		<680	<340	<390	400	<400
Benzo(g,h,i)perylene		<680	<340	<390	290	<400

BOR-19

(µg/kg)	Depth (ft)	0.5-1	2.5-3	7-7.5	11-11.5	14-14.5
Naphthalene		<6900	51	42	5400	50
2-Methylnaphthalene		<6900	<350	<410	17000	<390
Fluorene		<6900	<350	<410	790	<390
Phenanthrene		<6900	63	<410	760	<390
Chrysene		2300	46	<410	<3900	<390

BOR-24

(µg/kg)	Depth (ft)	1-1.5	2.5-3	7-7.5	11-11.5	14-14.5
Naphthalene		<350	38	41	41	47
Fluoranthene		42	<360	<390	<390	<400
Pyrene		46	<360	<390	<390	<400

BOR-21

(µg/kg)	Depth (ft)	0.5-1	2.5-3	7-7.5	11.5-12
Naphthalene		<350	48	43	42
Phenanthrene		190	<350	<400	<400
Anthracene		40	<350	<400	<400
Fluoranthene		440	<350	<400	<400
Pyrene		380	<350	<400	<400
Benzo(a)anthracene		170	<350	<400	<400
Chrysene		230	<350	<400	<400
Benzo(a)pyrene		63	<350	<400	<400

MWOR-5

(µg/kg)	Depth (ft)	1-1.5	7-7.5	10-10.5	12.5-13	14.5-15
Naphthalene		38	53	45	48	44
Phenanthrene		<350	370	<390	<400	<400
Anthracene		<350	85	<390	<400	<400
Fluoranthene		<350	630	<390	<400	<400
Pyrene		<350	670	56	<400	<400
Benzo(a)anthracene		<350	310	<390	<400	<400
Chrysene		<350	340	<390	<400	<400
Benzo(b)fluoranthene		<350	380	<390	<400	<400
Benzo(k)fluoranthene		<350	140	<390	<400	<400
Benzo(a)pyrene		<350	260	<390	<400	<400
Indeno(1,2,3-cd)pyrene		<350	210	<390	<400	<400
Benzo(g,h,i)perylene		<350	210	<390	<400	<400

BOR-12

(µg/kg)	Depth (ft)	0.5-1	3.5-4	8.5-9	11-11.5	14-14.5
Naphthalene		<680	39	72	<1200	<400
Phenanthrene		140	<350	42	200	52
Anthracene		<680	<350	<400	<1200	40
Fluoranthene		<680	<350	<400	350	83
Pyrene		78	<350	60	880	100
Benzo(a)anthracene		<680	<350	50	210	100
Chrysene		180	<350	<400	230	100
Benzo(b)fluoranthene		<680	<350	<400	450	<400
Benzo(k)fluoranthene		<680	<350	<400	170	<400
Benzo(a)pyrene		<680	<350	<400	380	<400
Indeno(1,2,3-cd)pyrene		<680	<350	<400	260	<400
Benzo(g,h,i)perylene		<680	<350	<400	320	<400

MWOR-4

(µg/kg)	Depth (ft)	1.5-2	2.5-3	10-10.5	14-14.5
Naphthalene		40	36	47	43
Phenanthrene		<350	51	<390	<400
Fluoranthene		<350	44	<390	<400
Pyrene		<350	47	<390	<400
Chrysene		<350	45	<390	<400

BOR-23

(µg/kg)	Depth (ft)	1-1.5	11-11.5	14.5-15
Naphthalene		39	99	49
Pyrene		<340	650	<400
Benzo(a)anthracene		<340	230	<400
Chrysene		<340	320	<400
Benzo(b)fluoranthene		<340	330	<400
Benzo(k)fluoranthene		<340	310	<400
Benzo(a)pyrene		<340	450	<400
Indeno(1,2,3-cd)pyrene		<340	390	<400
Benzo(g,h,i)perylene		<340	460	<400

BOR-27

(µg/kg)	Depth (ft)	1-1.5	7-7.5	12.5-13
Naphthalene		41	49	75
Phenanthrene		<340	<390	70
Pyrene		<340	<390	430
Benzo(a)anthracene		<340	<390	110
Chrysene		<340	<390	150
Benzo(b)fluoranthene		<340	<390	220
Benzo(k)fluoranthene		<340	<390	240
Benzo(a)pyrene		<340	<390	320
Indeno(1,2,3-cd)pyrene		<340	<390	340
Benzo(g,h,i)perylene		<340	<390	340

BOR-20

(µg/kg)	Depth (ft)	11.5-12
Fluoranthene		86
Pyrene		110
Benzo(a)pyrene		64

BOR-25

(µg/kg)	Depth (ft)	14-14.5
Naphthalene		44

BOR-26

(µg/kg)	Depth (ft)	13-13.5
Fluoranthene		110
Pyrene		160
Benzo(a)anthracene		55
Chrysene		65
Benzo(g,h,i)perylene		62

LEGEND

- Canonie Soil Boring Location
- Canonie Monitoring Well Location
- Fence
- Sanitary Sewer Line
- Storm Sewer Line
- Railroad
- Manhole
- Catch Basin

0 80 160
SCALE IN FEET

NOTES:
Boring and monitoring well locations were obtained from a base map provided by Canonie Environmental, Inc. The individual locations were digitized onto a base map CAD file provided by NAS Alameda.

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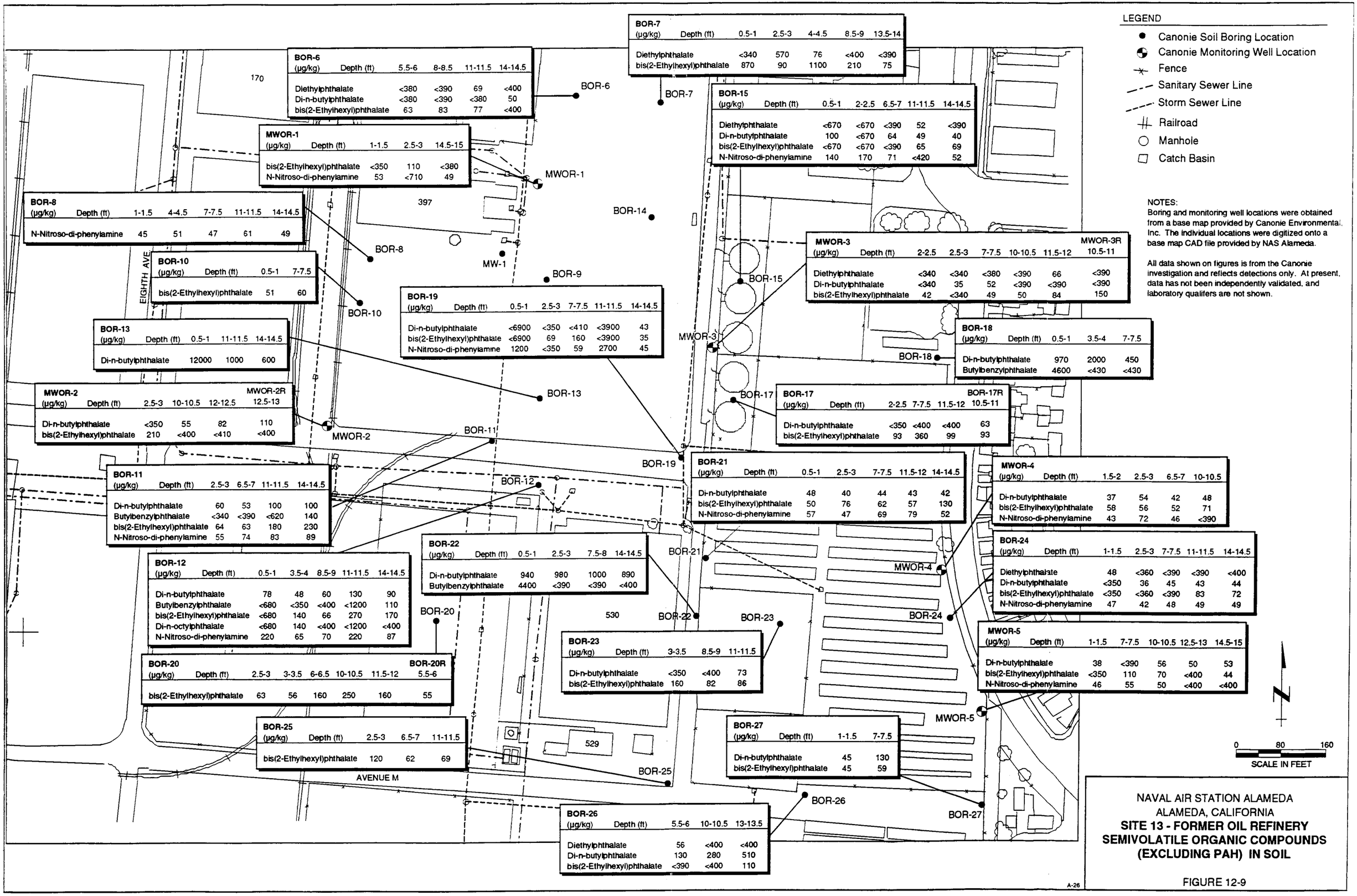
NAVAL AIR STATION ALAMEDA
ALAMEDA, CALIFORNIA
SITE 13 - FORMER OIL REFINERY
SEMIVOLATILE ORGANIC COMPOUNDS (PAH) IN SOIL

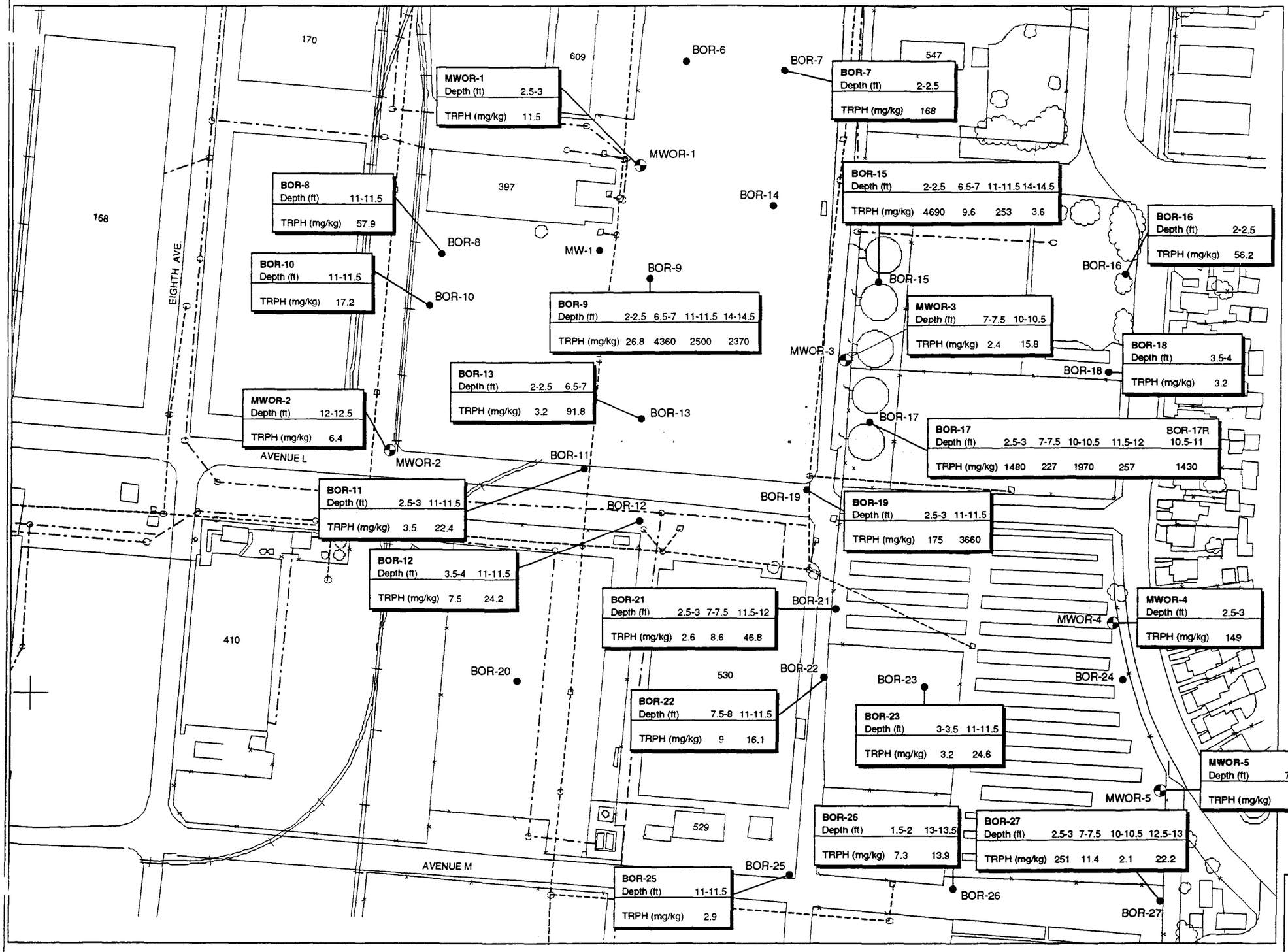
FIGURE 12-8

A-26



NAVAL AIR STATION ALAMEDA
ALAMEDA, CALIFORNIA
SITE 13 - FORMER OIL REFINERY
SEMIVOLATILE ORGANIC COMPOUNDS (EXCLUDING PAH) IN SOIL

FIGURE 12-9



LEGEND

- Canonie Soil Boring Location
- Canonie Monitoring Well Location
- Fence
- Sanitary Sewer Line
- Storm Sewer Line
- Railroad
- Manhole
- Catch Basin

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N

0 80 160
SCALE IN FEET

NAVAL AIR STATION ALAMEDA
ALAMEDA, CALIFORNIA
SITE 13 - FORMER OIL REFINERY
TOTAL RECOVERABLE
PETROLEUM HYDROCARBONS IN SOIL

FIGURE 12-10

LEGEND

- Canonie Soil Boring Location
- Canonie Monitoring Well Location
- Fence
- Sanitary Sewer Line
- Storm Sewer Line
- Railroad
- Manhole
- Catch Basin

NOTES:
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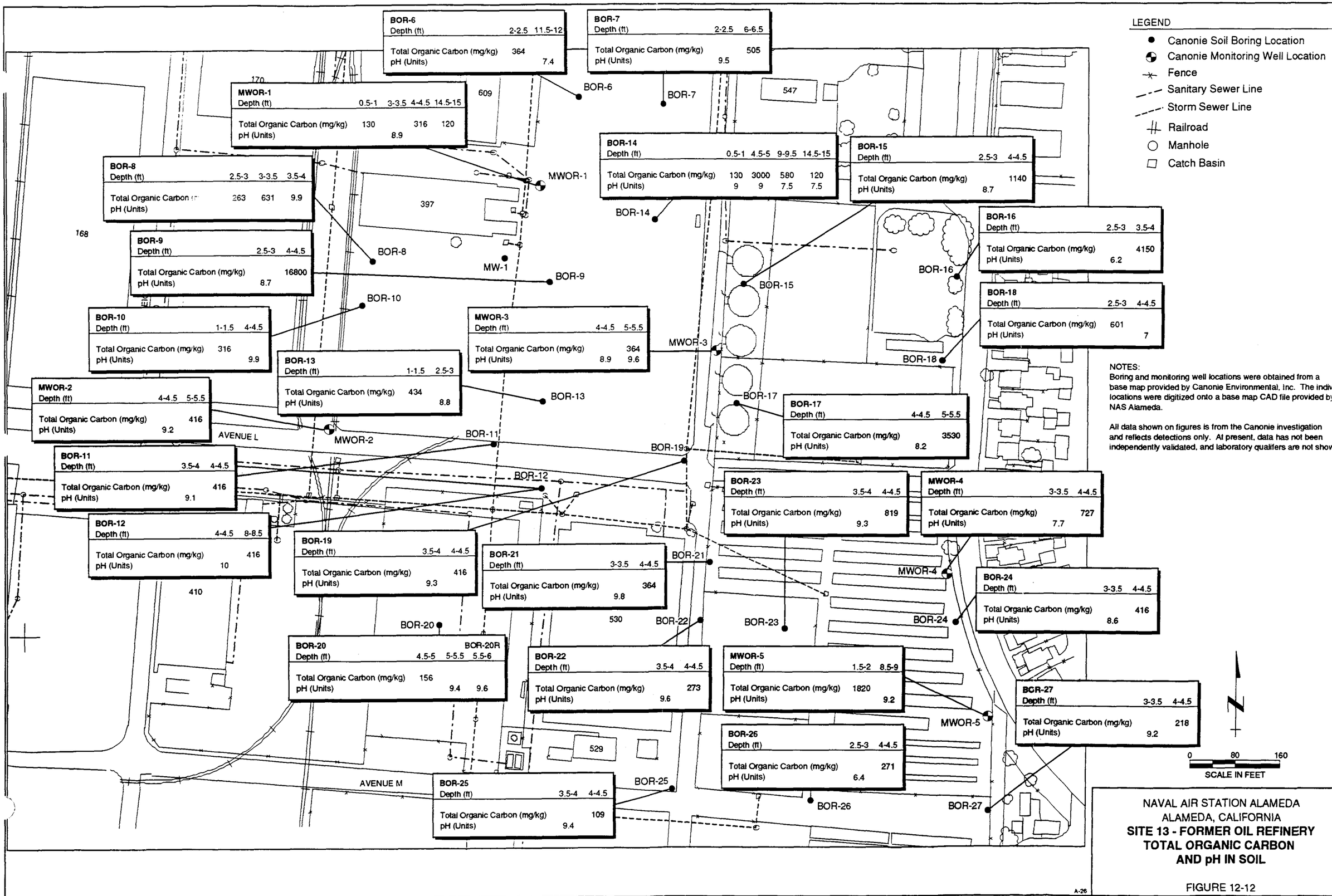
N

0 80 160
SCALE IN FEET

NAVAL AIR STATION ALAMEDA
ALAMEDA, CALIFORNIA
SITE 13 - FORMER OIL REFINERY
PESTICIDE AND PCB COMPOUNDS IN SOIL

FIGURE 12-11


BOR-6
Depth (ft) 2-2.5 11.5-12
Total Organic Carbon (mg/kg) 364
pH (Units) 7.4
BOR-7
Depth (ft) 2-2.5 6-6.5
Total Organic Carbon (mg/kg) 505
pH (Units) 9.5
MWOR-1
Depth (ft) 0.5-1 3-3.5 4-4.5 14.5-15
Total Organic Carbon (mg/kg) 130 316 120
pH (Units) 8.9
BOR-14
Depth (ft) 0.5-1 4.5-5 9-9.5 14.5-15
Total Organic Carbon (mg/kg) 130 3000 580 120
pH (Units) 9 9 7.5 7.5
BOR-15
Depth (ft) 2.5-3 4-4.5
Total Organic Carbon (mg/kg) 1140
pH (Units) 8.7
BOR-8
Depth (ft) 2.5-3 3-3.5 3.5-4
Total Organic Carbon (mg/kg) 263 631 9.9
pH (Units)
BOR-9
Depth (ft) 2.5-3 4-4.5
Total Organic Carbon (mg/kg) 16800
pH (Units) 8.7
BOR-16
Depth (ft) 2.5-3 3.5-4
Total Organic Carbon (mg/kg) 4150
pH (Units) 6.2
BOR-18
Depth (ft) 2.5-3 4-4.5
Total Organic Carbon (mg/kg) 601
pH (Units) 7
BOR-10
Depth (ft) 1-1.5 4-4.5
Total Organic Carbon (mg/kg) 316
pH (Units) 9.9
MWOR-3
Depth (ft) 4-4.5 5-5.5
Total Organic Carbon (mg/kg) 364
pH (Units) 8.9 9.6
BOR-13
Depth (ft) 1-1.5 2.5-3
Total Organic Carbon (mg/kg) 434
pH (Units) 8.8
MWOR-2
Depth (ft) 4-4.5 5-5.5
Total Organic Carbon (mg/kg) 416
pH (Units) 9.2
BOR-17
Depth (ft) 4-4.5 5-5.5
Total Organic Carbon (mg/kg) 3530
pH (Units) 8.2
BOR-11
Depth (ft) 3.5-4 4-4.5
Total Organic Carbon (mg/kg) 416
pH (Units) 9.1
BOR-23
Depth (ft) 3.5-4 4-4.5
Total Organic Carbon (mg/kg) 819
pH (Units) 9.3
MWOR-4
Depth (ft) 3-3.5 4-4.5
Total Organic Carbon (mg/kg) 727
pH (Units) 7.7
BOR-12
Depth (ft) 4-4.5 8-8.5
Total Organic Carbon (mg/kg) 416
pH (Units) 10
BOR-19
Depth (ft) 3.5-4 4-4.5
Total Organic Carbon (mg/kg) 416
pH (Units) 9.3
BOR-21
Depth (ft) 3-3.5 4-4.5
Total Organic Carbon (mg/kg) 364
pH (Units) 9.8
BOR-24
Depth (ft) 3-3.5 4-4.5
Total Organic Carbon (mg/kg) 416
pH (Units) 8.6
BOR-20
Depth (ft) 4.5-5 5-5.5 BOR-20R 5.5-6
Total Organic Carbon (mg/kg) 156
pH (Units) 9.4 9.6
BOR-22
Depth (ft) 3.5-4 4-4.5
Total Organic Carbon (mg/kg) 273
pH (Units) 9.6
MWOR-5
Depth (ft) 1.5-2 8.5-9
Total Organic Carbon (mg/kg) 1820
pH (Units) 9.2
BOR-27
Depth (ft) 3-3.5 4-4.5
Total Organic Carbon (mg/kg) 218
pH (Units) 9.2
BOR-26
Depth (ft) 2.5-3 4-4.5
Total Organic Carbon (mg/kg) 271
pH (Units) 6.4
BOR-25
Depth (ft) 3.5-4 4-4.5
Total Organic Carbon (mg/kg) 109
pH (Units) 9.4
LEGEND
Canonie Soil Boring Location
Canonie Monitoring Well Location
Fence
Sanitary Sewer Line
Storm Sewer Line
Railroad
Manhole
Catch Basin
NOTES:
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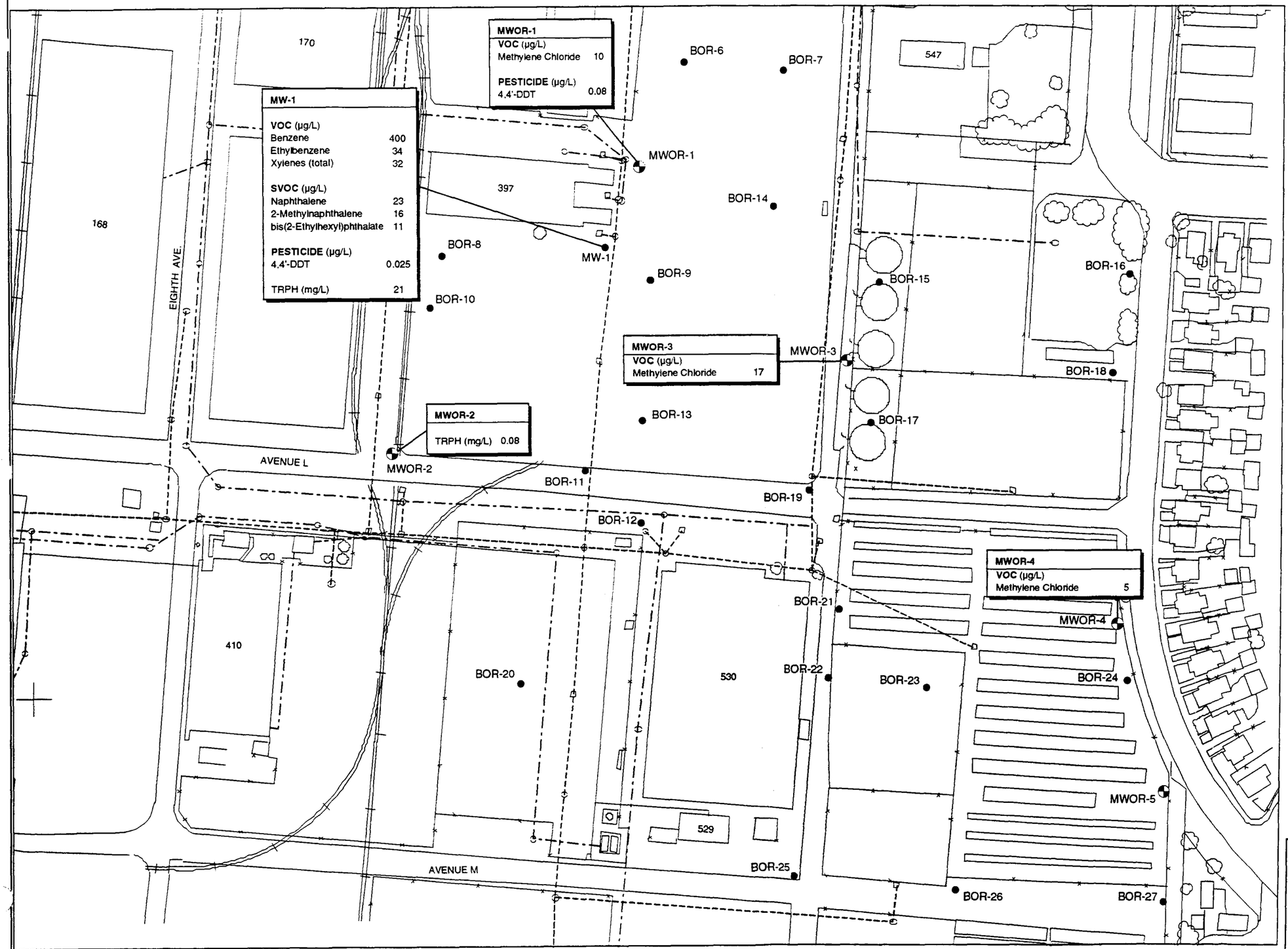
0 80 160
SCALE IN FEET
NAVAL AIR STATION ALAMEDA
ALAMEDA, CALIFORNIA
SITE 13 - FORMER OIL REFINERY
TOTAL ORGANIC CARBON
AND pH IN SOIL
FIGURE 12-12
A-26



LEGEND

- Canonie Soil Boring Location
- Canonie Monitoring Well Location
- Fence
- Sanitary Sewer Line
- Storm Sewer Line
- Railroad
- Manhole
- Catch Basin

NOTES:
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0 80 160
SCALE IN FEET

NAVAL AIR STATION ALAMEDA
ALAMEDA, CALIFORNIA

SITE 13 - FORMER OIL REFINERY
VOLATILE & SEMIVOLATILE ORGANIC COMPOUNDS, TRPH, AND PESTICIDE AND PCB COMPOUNDS IN GROUNDWATER

FIGURE 12-13

MWOR-1	(mg/L)
Aluminum	46
Barium	0.37
Calcium	359
Chromium	0.13
Copper	0.042
Iron	59
Magnesium	98
Manganese	12
Nickel	0.19
Potassium	14
Sodium	390
Titanium	1.4
Vanadium	0.11
Zinc	0.12

MW-1	(mg/L)
Aluminum	50
Barium	0.66
Calcium	82
Chromium	0.15
Copper	0.051
Iron	92
Magnesium	81
Manganese	2.7
Nickel	0.19
Potassium	25
Sodium	506
Titanium	1.3
Vanadium	0.13
Zinc	0.18

MWOR-3	(mg/L)
Aluminum	386
Barium	1.9
Beryllium	0.0084
Calcium	113
Chromium	1.1
Cobalt	0.25
Copper	0.32
Iron	465
Lead	0.054
Magnesium	128
Manganese	11
Nickel	1.7
Potassium	43
Selenium	0.18
Sodium	172
Titanium	7.3
Vanadium	0.76
Zinc	0.86

MWOR-4	(mg/L)
Aluminum	244
Barium	1.7
Beryllium	0.0055
Calcium	61
Chromium	0.72
Cobalt	0.17
Copper	0.19
Iron	300
Magnesium	80
Manganese	4.8
Nickel	0.92
Potassium	16
Selenium	0.12
Sodium	47
Titanium	5.6
Vanadium	0.55
Zinc	0.56

MWOR-2	(mg/L)
Aluminum	184
Arsenic	0.077
Barium	0.88
Beryllium	0.0054
Calcium	83
Chromium	0.6
Cobalt	0.14
Copper	0.26
Iron	266
Lead	0.18
Magnesium	94
Manganese	3.4
Nickel	0.71
Potassium	34
Selenium	0.097
Sodium	353
Titanium	4.7
Vanadium	0.55
Zinc	0.68

MWOR-5	(mg/L)
Aluminum	223
Barium	1.3
Beryllium	0.0056
Calcium	23
Chromium	0.65
Cobalt	0.13
Copper	0.25
Iron	296
Lead	0.055
Magnesium	81
Manganese	5.4
Nickel	0.8
Potassium	35
Selenium	0.12
Sodium	97
Titanium	5.4
Vanadium	0.51
Zinc	0.63

LEGEND

- Canonie Soil Boring Location
- Canonie Monitoring Well Location
- Fence
- Sanitary Sewer Line
- Storm Sewer Line
- Railroad
- Manhole
- Catch Basin

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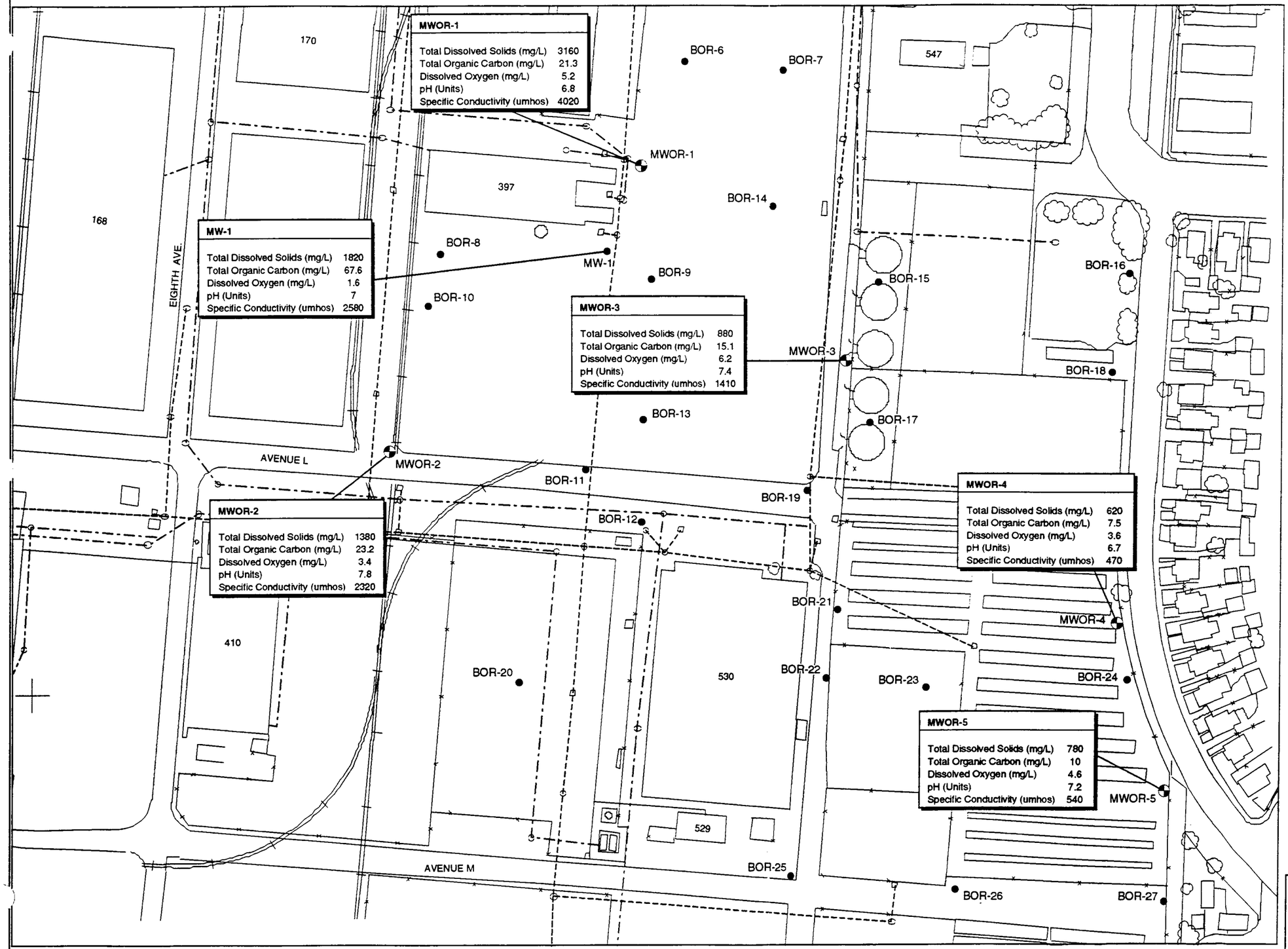
0 80 160
SCALE IN FEET

NAVAL AIR STATION ALAMEDA
ALAMEDA, CALIFORNIA
SITE 13 - FORMER OIL REFINERY
METALS IN GROUNDWATER

FIGURE 12-14

A-27



LEGEND

- Canonie Soil Boring Location
- Canonie Monitoring Well Location
- Fence
- Sanitary Sewer Line
- Storm Sewer Line
- Railroad
- Manhole
- Catch Basin

NOTES:
Boring and monitoring well locations were obtained from a base map provided by Canonie Environmental, Inc. The individual locations were digitized onto a base map CAD file provided by NAS Alameda.

All data shown on figures is from the Canonie investigation and reflects detections only. At present, data has not been independently validated, and laboratory qualifers are not shown.

0 80 160
SCALE IN FEET

NAVAL AIR STATION ALAMEDA
ALAMEDA, CALIFORNIA
SITE 13 - FORMER OIL REFINERY
GENERAL CHEMICAL CHARACTERISTICS OF GROUNDWATER

FIGURE 12-15

A-27

13.0 SITE 16 - CANS C-2 AREA

13.1 SITE DESCRIPTION AND BACKGROUND

Site 16 (Initial Assessment Study Site 6) consists of the CANS C-2 Area located at the southeast corner of NAS Alameda between Avenues M and N and east of Eleventh Street (Figure 1-2). The area occupies 6.5 acres; 3 acres are a storage yard and 3.5 acres contain CANS, large shipping containers that have been converted into storage containers. The storage yard formerly was used to store paints, solvents, acids and bases as well as transformers containing PCB oils. Apparently, the storage containers and drums became corroded and leaked, and then were left open in the storage yard over a period of years (Canonie, 1990c).

According to the IAS (E&E, 1983), PCBs were used for weed control in the storage yard until 1963 and a PCB transformer leaked oil into the northwest corner of the site. The same report stated that base environmental personnel indicated that 10 cubic yards of PCB-contaminated soil from the transformer spill was removed by IT Corporation in August 1982 and that remaining soil in the area contains less than 1 mg/kg of PCBs.

13.2 CURRENT USE

Presently, the storage yard at Site 16 is used to store various obsolete equipment and miscellaneous parts such as paint stripping baths, electrical equipment, aircraft parts, etc. The yard is primarily unpaved, although temporary runway plates made of perforated steel cover much of the surface (Canonie, 1990c).

13.3 PREVIOUS INVESTIGATIONS

Wahler Associates (Wahler) conducted an initial round of surface soil and groundwater sampling in 1985 in response to the recommendations of the IAS. They collected 10 surface soil samples at depths of approximately 6 inches bgs; from a monitoring well they collected one groundwater sample and one soil sample from 6 feet bgs. The samples were analyzed for organochlorine pesticides and PCBs (by EPA Method 608), two chlorophenoxyl herbicides, 17 metals, and gasoline hydrocarbons. With one exception (0.05 mg/kg gasoline hydrocarbons), no organics were detected in the soil samples. In groundwater, 0.002 mg/L of 2,4-D was reported. Soil detection limits were 0.5 mg/kg for PCBs, and 0.02 mg/kg for the majority of the chlorinated pesticides (methoxychlor and Toxaphene had detection limits of 0.5 and 2.0 mg/kg, respectively). The two chlorinated herbicides, 2,4-dichlorophenoxyacetic acid (2,4-D) and 2,4,5-TP, had soil detection limits of 0.001 mg/kg.

Only one metal, chromium, at 0.13 mg/L, was detected in the groundwater sample; detection limits for other metals ranged from 0.1 to 1.0 mg/L. The following eight metals were detected in all ten of the surface soil samples and the single subsurface soil sample: barium (18 to 53 mg/kg); cadmium (0.55 to 15 mg/kg); chromium (3.8 to 44 mg/kg); cobalt (3.6 to 6.0 mg/kg); copper (6.5 to 26 mg/kg); lead (5.2 to 120 mg/kg); nickel (19 to 36 mg/kg); vanadium (11 to 24 mg/kg); and zinc (18 to 190 mg/kg). Antimony, arsenic, beryllium, mercury, molybdenum, selenium, silver, and thallium were not detected in any of the soil samples.

13.4 REMEDIAL INVESTIGATION

The purpose of the remedial investigation was to evaluate whether the soil and groundwater have been impacted by chemicals of concern. Canonie conducted surface soil sampling and drilled nine soil borings, and then converted three of these boreholes to monitoring wells in the storage yard of the CANS C-2 Area. The locations of the borings and monitoring wells are shown on Figure 13-1. Monitoring wells were constructed with 2-inch, Schedule 40 PVC with the screened interval extending from 5 to 15 feet bgs. Boring logs and well construction details are presented in Appendix C.

13.4.1 Site Geology/Hydrogeology

Boring logs prepared by Canonie indicate that the site is underlain by artificial fill ranging in thickness from 12 to at least 15 feet bgs (total depth for the borings). The artificial fill consists of light to dark brown, silty fine sand with traces of clay, gravel, and shell fragments. Native sediments consisting of the Bay Mud Unit were encountered in two borings, BC2-4 and BC2-5, near the north central portion of the yard. In these borings, the Holocene Bay Mud Unit was encountered at 12 and 13 feet bgs, respectively, and was composed of dark gray, clayey silt or silty clay. Figure 13-2 presents a cross section showing the subsurface lithology based on the Canonie borings. The geotechnical laboratory results for Site 16 are listed in Table 13-1 and Appendix D. Constant-head laboratory tests indicate that the saturated soils at Site 16 have hydraulic conductivities ranging between 1.6×10^{-6} and 1.9×10^{-4} cm/sec.

Groundwater was encountered between 4.5 and 5.5 feet bgs during drilling. Water level measurements taken by Canonie on November 8, 1990 ranged between 4.84 and 6.64 feet bgs. The local groundwater gradient is 0.002 foot/foot in the northwestern portion of the yard and 0.005 foot/foot in the southwestern portion of the site (Figure 2-4). The local groundwater flow is toward the southwest. Groundwater samples collected from monitoring wells MWC2-1 through MWC2-3 contained TDS concentrations ranging from 350 mg/L to 780 mg/L.

13.4.2 Analytical Results - Soil Samples

A total of 154 soil samples were collected from nine borings and 55 surface locations at Site 16; of these 154 samples, 149 were field samples and five were duplicate samples. The surface soil samples were all analyzed for VOCs; SVOCs; pesticides/PCBs and herbicides; metals; TOC, pH and cation exchange capacity (CEC); and general chemical characteristics. Many of the subsurface soil samples from the borings were analyzed for VOCs, SVOCs, pesticide and PCB compounds, metals, and cyanide. At least one sample from each boring was sampled for TOC, chlorinated herbicides, cations and anions, pH, and miscellaneous other parameters. Table 13-2 presents a complete summary of analyses by sample.

13.4.2.1 Volatile Organic Compounds. Forty-one soil samples from various depths in all the borings were analyzed for VOCs. All of the samples contained detectable concentrations of one or more of nine different VOCs. Table 13-3 summarizes the VOCs detected and Figure 13-3 shows the locations of the borings where the VOCs were detected. The VOCs detected were methylene chloride, acetone, carbon disulfide, 1,1-DCA, 1,2-DCE, 2-butanone, toluene, 1,4-dichlorobenzene, and 1,2-dichlorobenzene.

Methylene chloride was detected in 38 of the 41 samples analyzed for VOCs. Acetone was detected in 30 of the samples, and toluene in 30 samples. Carbon disulfide was detected in the deepest samples analyzed for VOCs from five of the nine borings. 1,1-DCA was detected in one sample, 1,2-DCE in three samples, and 2-butanone in seven samples. 1,2- and 1,4-Dichlorobenzene were detected in two samples and one sample, respectively. No soil samples contained total VOC concentrations above 1 mg/kg.

13.4.2.2 Semivolatile Organic Compounds. All 55 surface soil samples and 45 of the boring samples were analyzed for SVOCs. Thirty of the surface samples and five samples from depths in the range of 5.5 to 14.5 feet bgs in borings MWC2-2 and BC2-4 had detectable concentrations of one or more of the SVOCs. SVOC concentrations are summarized in Table 13-4 and shown on Figure 13-4. The SVOCs detected are 1,2-dichlorobenzene, 2,4-dimethylphenol, naphthalene, 2-methylnaphthalene, acenaphthalene, fluorene, phenanthrene, anthracene, di-n-butylphthalate, fluoranthene, pyrene, benzo(a)anthracene, chrysene, bis(2-ethylhexyl)phthalate, benzo(b)fluoranthene, benzo(k)fluoranthene, benzo(a)pyrene, indeno(1,2,3-cd)pyrene, dibenzo(a,h)anthracene, and benzo(g,h,i)perylene, several of which are PAH compounds. Four of the surface soil samples (SSC2-2, SSC2-4, SSC2-23, and SSC2-28) contained total SVOC concentrations above 10 mg/kg.

13.4.2.3 Pesticides/PCBs and Herbicides. One-hundred-one soil samples collected at Site 16 were analyzed for pesticides/PCB compounds. One or more of six pesticides and three PCBs were detected in 17 soil samples. Fifteen of these are for depths above 1.5 feet. The pesticides detected were alpha-BHC, beta-BHC,

gamma-BHC, 4,4'-DDD, 4,4'-DDE, and 4,4'-DDT. The three PCBs were Aroclor-1248, Aroclor-1254, and Aroclor-1260. The summary of the analytical results for pesticides and PCBs detected are listed on Table 13-5 and shown on Figure 13-5. No soil samples contained pesticide concentrations above 1 mg/kg. Nine surface soil samples contained PCB concentrations above 1 mg/kg.

Two surface samples of the 67 soil samples analyzed for herbicides contained detectable concentrations of glyphosate.

13.4.2.4 Metals. All 55 of the surface soil samples and 45 of the boring samples were analyzed for 23 metals. Background ranges of metals in soil have been estimated for NAS Alameda based on a study conducted by the PRC team under CTO 121 Mod. 0001. Results of this study are included in the background data summary report (PRC/JMM, 1992c). The estimated background ranges of metals in soil are given in Table 3-1. Based on these background data, 17 metals were detected at a concentration above the 95 percent/95 percent statistical tolerance interval calculated during the background study. These metals include: antimony, arsenic, barium, cadmium, calcium, chromium, cobalt, copper, iron, lead, magnesium, manganese, nickel potassium, silver, thallium, and zinc.

The metals results were also compared to Native Soil Concentrations of Various Elements (Dragun, 1988), and are listed in Table 3-2. All sample results fell within the expected range for native soils except for 133 occurrences in 50 samples, which are discussed below. All but one of these occurrences was in the surface soil samples. Metals data are summarized and presented in Table 13-6.

Antimony was detected in one sample at 31 mg/kg, above the maximum of the expected range, 10 mg/kg. Magnesium was detected above the maximum of the expected range, 6,000 mg/kg, in 12 samples at concentrations of 7,360 to 9,770 mg/kg. Eight other metals were detected at concentrations above the expected range but within the extreme range; arsenic (16 samples), cadmium (33 samples), copper (8 samples), lead (22 samples), molybdenum (16 samples), silver (24 samples), thallium (24 samples), and zinc (17 samples).

13.4.2.5 Total Organic Carbon, pH, and Cation Exchange Capacity. Ten boring samples were analyzed for TOC, 11 for cation exchange capacity, and 12 for pH. The analytical results are summarized in Table 13-7.

13.4.2.6 General Chemical Characteristics. Eight boring samples were analyzed for ash, and nine each were analyzed for chloride, nitrate (as N), sulfate, TKN, and total phosphorus. All 55 surface soil

samples and 46 boring samples were analyzed for total cyanide; 18 of the surface samples were reported with detected concentrations of total cyanide. Table 13-8 summarizes these data.

13.4.3 Analytical Results - Groundwater Samples

Groundwater samples were collected from the three monitoring wells at this site, MWC2-1, MWC2-2, and MWC2-3, and analyzed for the following parameters, VOCs, SVOCs, TRPH, metals, and general chemical characteristics.

13.4.3.1 Volatile Organic Compounds. Two VOCs, methylene chloride and TCE, were detected at low concentrations in monitoring well MWC2-2, methylene chloride was detected in MWC2-1. VOCs were not detected in MWC2-3. The data are summarized in Table 13-9 and shown on Figure 13-6.

13.4.3.2 Semivolatile Organic Compounds. SVOCs were not detected in the three monitoring wells.

13.4.3.3 Total Recoverable Petroleum Hydrocarbons. TRPH was not detected in the three monitoring wells.

13.4.3.4 Metals. Concentrations of metals detected in groundwater were compared to background ranges of metals calculated for the base and ranges contained in the literature. Background ranges of metals in groundwater have been estimated for NAS Alameda based on a study conducted by the PRC team under CTO 121 Mod. 0001. Results of this study are included in the background data summary report (PRC/JMM, 1992c). The estimated background ranges of metals in groundwater are given in Table 3-3. Based on these background data, ten metals were detected at concentrations exceeding background. These metals are arsenic, chromium, cobalt, copper, iron, lead, nickel, vanadium, and zinc.

Concentrations of metals detected in groundwater samples were compared to Natural Concentrations of Various Elements in Groundwater listed in Table 3-4 (Dragun, 1988). According to the Canonie QAPP and QA/QC plan, groundwater samples for metals were field filtered as appropriate with a 0.45-micron filter (Canonie, 1990b). Six metals were detected at concentrations above the typical range, aluminum, chromium, cobalt, copper, lead, manganese, and nickel. An additional metal, manganese, was also detected above the typical range, but within the extreme range. Table 13-10 and Figure 13-7 summarize the metals results.

13.4.3.5 General Chemical Characteristics. Additional groundwater quality parameters were measured and are summarized in Tables 13-11 and 13-12 and presented on Figure 13-8. These measurements

include TOC, shown on Table 13-9, specific conductance, dissolved oxygen, pH, bicarbonate alkalinity (as $CaCO_3$), carbonate alkalinity (as $CaCO_3$), total alkalinity (as $CaCO_3$), chloride, sulfate, TDS, total hardness (as $CaCO_3$), and total cyanide.

13.5 SUMMARY AND CONCLUSIONS

The purpose of the data summary report is to provide an indication of the compounds identified at each of the Phases 1 and 2A sites, and to determine if there is sufficient information to evaluate the lateral and vertical extent of chemicals of concern in the soil and groundwater. Presently, QA/QC information is not available for data validation, and as a result, the data presented in this report have not been validated under EPA CLP procedures. Consequently, the summary and conclusions presented below are qualitative and subject to revision.

13.5.1 Soils

Canonie collected 55 surface soil samples and 99 subsurface soil samples from depths of 0.5 to 15.0 feet. The subsurface samples were acquired from nine borings. With the exception of borings BC2-4 and BC2-5, which penetrated the Holocene Bay Mud Unit at depths of 12 and 13 feet, respectively, the borings were completed to depths of 13 to 15 feet in artificial fill. The water table was reported to be between 4.5 and 6.6 feet bgs. However, as shown in Figure 13-1, all surface soil and subsurface soil samples were collected at the western side of the site.

VOCs, SVOCs, metals, pesticides and PCBs, and herbicides were found in the soils at Site 16. In most cases, the pattern of occurrences are significantly different between the surface or near-surface samples, and the deeper samples from the borings.

The surface soil samples were not analyzed for VOCs. Three VOCs, methylene chloride, acetone, and toluene, were detected in samples over a range of depths from all nine borings. Occurrence and distribution of these VOCs suggest that they may be laboratory artifacts. Carbon disulfide was detected in five boring samples throughout the site, and was found in the deepest sample (within the saturated zone). Two of these occurrences are in the Holocene Bay Mud Unit encountered in borings BC2-4 and BC2-5. 2-Butanone was detected at four of the deepest samples (two in the Holocene Bay Mud Unit) and three shallower depths in the north-central part of the area. 1,1-DCA was detected in only one sample, at intermediate depth in boring BC2-7. 1,2-DCE was detected in intermediate depth samples from borings BC2-7 and BC2-8 in the south-central part of the area, and in the deepest sample from BC2-7. 1,2- and 1,2-Dichlorobenzene were detected only at intermediate depth in boring BC2-4. Methylene chloride and acetone were reportedly detected in laboratory blanks and therefore may

not be present in the soil samples. The remaining VOCs detected were at low levels near the detection limits. No distinct distribution patterns are observed from these VOC data. No soil samples contained total VOC level above 1 mg/kg.

SVOCs (primarily PAH compounds) were detected at a majority of the surface soil samples throughout Site 16. However, samples from only two of the borings, MWC2-2 and BC2-4, in the northwestern portion of the area were found to contain SVOCs. In both cases, the SVOCs were detected within the saturated zone at intermediate depth and in the deepest samples. bis(2-Ethylhexyl)phthalate was the SVOC that was detected in most of the soil samples. The highest concentration of bis(2-ethylhexyl)phthalate was detected in surface soil samples SS12-28 at 90,000 μg/kg. Four surface soil samples contained total SVOC concentration above 10 mg/kg.

For the 55 surface soil samples, there were 344 occurrences in all 55 samples of 17 metals (antimony, cadmium, copper, lead, magnesium, molybdenum, selenium, silver, zinc, arsenic, barium, calcium, chromium, cobalt, iron, manganese, nickel, and potassium) that were above the 95 percent/95 percent statistical tolerance limit for background concentrations in soils at NAS Alameda (Table 3-1) (PRC/JMM, 1992c). However, for the same group of samples, there were only 132 occurrences in 49 samples of nine metals (the first nine listed in the previous sentence) that were above the expected range for native soils (Dragun, 1988) (Table 3-2).

For the 45 subsurface boring samples analyzed for metals, there were eight occurrences in three samples of six metals (cadmium, cobalt, copper, nickel, potassium, and sodium) that were above the 95 percent/95 percent statistical tolerance interval for background concentrations at NAS Alameda (Table 3-1) (PRC/JMM, 1992c). Five of these eight occurrences were in a single sample from boring MWC2-1. This same sample was the only subsurface soil sample indicating a metal (magnesium) concentration above the expected range for native soils (Dragun, 1988) (Table 3-2).

Pesticides and/or PCBs were detected in 15 surface or near-surface (above 1.5 feet) soil samples distributed throughout Site 16. Two samples collected from borings (MWC2-2 and BC2-6) at 9.0 to 25 feet, respectively contained low levels of pesticides. Glyphosate from chlorinated herbicides was detected in two surface soil samples in the north-central part of the site. Three PCBs (Aroclor-1248, Aroclor-1254, and Aroclor-1260) were detected in nine surface soil samples at concentrations above 1 mg/kg. Eight of the nine samples were located at the northwestern corner of the site.

All 55 surface soil samples and 46 subsurface boring samples were analyzed for total cyanide. Cyanide was detected in only 18 of the surface soil samples.

Various other analyses were performed on soil samples from the borings to determine pH, cation exchange capacity, percent ash, and concentrations of chloride, nitrate, sulfate, TKN, and total phosphorus.

If the analytical results can be validated and are considered to be acceptable, the following conclusions can be made:

- No soil samples were collected at the eastern side of the site. Therefore, additional soil sampling and analysis is required to characterize the surface and subsurface soil at the eastern side of the site.
- VOCs do not appear to be a major concern in surface and subsurface soil at the western side of the site.
- Soil samples collected at the northwestern part of the site contained total SVOC concentrations above 10 mg/kg and PCBs above 1 mg/kg, possibly indicating a potential source area. Additional data are required to characterize the distribution of the SVOCs and PCBs in this area.
- Soil samples from SSC2-28 also contained elevated PCB concentrations; therefore, additional soil investigation is required to characterize the PCBs around this area.
- Sufficient soil data for metals, pesticides, and cyanide are available for this site to proceed with the RI/FS.

The significance of the presence of these VOCs, SVOCs, and metals will be further evaluated during the risk assessment to be performed during the comprehensive RI/FS work.

13.5.2 Groundwater

Analyses of three groundwater samples from the three monitoring wells indicated no SVOCs and no TRPH. The groundwater samples were also analyzed for pH, dissolved oxygen, TOC, specific conductivity, bicarbonate alkalinity, carbonate alkalinity, total alkalinity, chloride, sulfate, TDS, and total hardness.

VOCs were detected in samples from MWC2-1 and MWC2-2 in the northern part of the area, but not in MWC2-3 in the southern part of the area. Total cyanide was detected in the sample from MWC2-2, but not in the samples from the other two wells.

The three groundwater samples were analyzed for 17 metals, yielding 25 occurrences of 10 metals (aluminum, chromium, cobalt, copper, iron, lead, nickel, selenium, vanadium, and zinc) that were above the 95 percent/95 percent statistical tolerance interval for background concentrations in groundwater at NAS Alameda (Table 3-3) (PRC/JMM, 1992c). For these same samples, there were 15 occurrences of seven metals

(aluminum, chromium, cobalt, copper, lead, manganese, and nickel) that were above the expected range for native groundwater (Dragun, 1988) (Table 3-4).

If the analytical results can be validated and are considered to be acceptable, the following conclusions can be made:

- Because TCE was not detected in the soil samples collected from this site and only a low concentration of TCE was found in well MWC2-2, it is unlikely that the presence of TCE in groundwater is due to an on-site source.
- Metals are present in the groundwater at concentrations exceeding the 95 percent/95 percent statistical tolerance interval.
- Because elevated levels of PCBs were found in surface soil samples, groundwater samples from Site 16 should also be analyzed for PCBs.
- Additional groundwater monitoring data are required to further evaluate the groundwater quality.
- Additional TDS data are required to evaluate whether groundwater beneath the site is considered potential drinking water.
- At present, no information is available to evaluate the tidal influence on groundwater and the deeper groundwater-bearing zone. Additional work is required to evaluate the tidal influence and the deeper groundwater-bearing zone.

The significance of the presence of these VOCs and metals in groundwater will be further evaluated during the risk assessment to be performed during the comprehensive RI/FS work.

TABLE 13-1

SITE 16 - CANS C-2 AREA
GEOTECHNICAL SAMPLE LABORATORY TEST RESULTS

Sample No.	Depth (ft)	Soil Classification Laboratory	Soil Classification Field	Moisture Content (%)	Dry Density (pcf)	Specific Gravity	Hydraulic Conductivity (cm/s)
MWC2-1	3.5	SP	SM	18.0	101.9	NA	2.00E-03
MWC2-1	6.5	SP	SM	NA	NA	NA	NA
MWC2-1	13	SM	SM	NA	NA	NA	NA
MWC2-2	13	SP/SM	SM	22.4	102.2	NA	NA
BC2-4	1	SP	SM	3.1	100.5	NA	9.00E-04
BC2-4	7	SP/SM	SM	22.4	103.9	NA	8.00E-04
BC2-4	12	SC/SM	ML	23.6	100.4	NA	1.00E-06
BC2-5	9.5	SP	SM	13.1	108.6	NA	NA
BC2-5	13	SC	SM				
BC2-6	5.5	SC	SM	NA	NA	NA	NA
BC2-8	2	SW/SM	SM	NA	NA	NA	NA
BC2-8	8.5	SM	SM	NA	NA	NA	NA
BC2-8	10	SM	SM	24.9	97.1	NA	2.00E-04
BC2-8	12	SM	SM	20.0	104.5	NA	NA
BC2-9	1	SP	SM	3.8	96.3	2.68	3.00E-04
BC2-9	2	SP	SM				
BC2-9	8	SM	SM	16.0	102.1	NA	NA
BC2-9	11.5	SM	SM				
BC2-9	12.5	SM	SM	21.0	104.1	NA	2.00E-06

Notes:
NA - Not Analyzed
Parameters not detectect are reported as less than method detection limit.

Laboratory Methods (Units):
Soil Classification - Unified Soil Classification System (USCS) - ASTM D2488
Moisture Content - ASTM D2216 (percent)
Dry Density - ASTM D2937 (pounds per cubic foot)
Specific Gravity - ASTM D854
Hydraulic Conductivity - EPA 9100 (centimeters per second)

Soil Classification Legend:

GW Well graded gravels, gravel-sand mixtures, little or no fines

GP Poorly graded gravels, gravel-sand mixtures, little or no fines

GM Silty gravels, gravel-sand-silt mixtures

GC Clayey gravels, gravel-sand-clay mixtures

SW Well graded sands, gravelly sands, little or no fines

SP Poorly-graded sands, gravelly sands, little or no fines

SM Silty sands, sand-silt mixtures

SC Clayey sands, sand-clay mixtures

ML Inorganic silts and very fine sands, rock flour silty or clayey fine sands or clayey silts with slight plasticity

CL Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, silty clays, lean clays

OL Organic silts and organic silty clays or low plasticity

CH Inorganic clays of high plasticity, fat clays

TABLE 13-2
SITE 16 – SUMMARY OF LABORATORY ANALYSES PERFORMED ON SOIL AND GROUNDWATER SAMPLES
PAGE 1 OF 6

FINAL DATA SUMMARY REPORT RI/FS
PHASE 1 AND 2A, VOLUME I

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TABLE 13-2

SITE 16 - CANS C-2 AREA
SUMMARY OF LABORATORY ANALYSES PERFORMED ON SOIL AND GROUNDWATER SAMPLES
(Sheet 2 of 6)

Boring	Depth	Matrix	Alkalinity/Acidity	Ammonia	Ammonium	Asbestos (Tot)	Ash (Tot)	SVOC	BTU Value	Cations/Anions	CEC	Cyanide (Tot)	DO (Tot)	EDB	Herb Uniq	Herbicides	Mercury	Metals	Pest/PCB	pH	Phosphorous	Potassium	Radiation	Spec. Con.	Kjeldahl Nitrogen	TOC	TPH as Diesel	TRPH	TS/TDS	VOC
BC2-6	**11.0-11.5**	**Soil**																												•
BC2-6	13.0-13.5	Soil																												•
BC2-6	**14.0-14.5**	**Soil**					•				•						•	•												
BC2-6R	1.0-1.5	Soil					•				•				•		•	•												
BC2-7	**0.5-1.0**	**Soil**					•				•				•		•	•												
BC2-7	2.5-3.0	Soil																	•											•
BC2-7	**3.5-4.0**	**Soil**												•					•											
BC2-7	4.0-4.5	Soil			•		•	•	•	•				•						•				•	•					
BC2-7	**5.0-5.5**	**Soil**					•				•						•	•												
BC2-7	7.0-7.5	Soil																												•
BC2-7	**9.5-10.0**	**Soil**					•				•						•	•												
BC2-7	11.0-11.5	Soil																												•
BC2-7	**13.5-14.0**	**Soil**																												•
BC2-7	14.0-14.5	Soil					•				•						•	•												
BC2-8	**0.5-1.0**	**Soil**					•				•				•		•	•												
BC2-8	3.5-4.0	Soil																	•											•
BC2-8	**4.0-4.5**	**Soil**			•		•		•	•				•						•				•	•					
BC2-8	5.0-5.5	Soil					•				•						•	•												
BC2-8	**7.0-7.5**	**Soil**																												•
BC2-8	9.5-10.0	Soil					•				•						•	•												
BC2-8	**11.0-11.5**	**Soil**																												•
BC2-8	14.0-14.5	Soil																												•
BC2-8	**14.5-15.0**	**Soil**					•				•						•	•												
BC2-8R	1.0-1.5	Soil					•				•				•		•	•												
BC2-9	**0.5-1.0**	**Soil**					•				•				•		•	•												
BC2-9	3.5-4.0	Soil																	•											•
BC2-9	**4.0-4.5**	**Soil**			•				•	•				•						•				•	•					
BC2-9	5.5-6.0	Soil					•				•						•	•												
BC2-9	7.0-7.5	Soil																												•

TABLE 13-2

SITE 16 - CANS C-2 AREA
SUMMARY OF LABORATORY ANALYSES PERFORMED ON SOIL AND GROUNDWATER SAMPLES
(Sheet 3 of 6)

Boring	Depth	Matrix	Alkalinity/Acidity	Ammonia	Ammonium	Asbestos (Tot)	Ash (Tot)	SVOC	BTU Value	Cations/Anions	CEC	Cyanide (Tot)	DO (Tot)	EDB	Herb Uniq	Herbicides	Mercury	Metals	Pest/PCB	pH	Phosphorous	Potassium	Radiation	Spec. Con.	Kjeldahl Nitrogen	TOC	TPH as Diesel	TRPH	TS/TDS	VOC
BC2-9	9.5-10.0	Soil					•				•						•	•												
BC2-9	11.0-11.5	Soil																											•	
BC2-9	13.0-13.5	Soil																											•	
BC2-9	14.0-14.5	Soil					•				•						•	•												
MWC2-1	0.5-1.0	Soil					•		•	•	•				•		•	•												
MWC2-1	2.0-2.5	Soil					•																						•	
MWC2-1	2.5-3.0	Soil									•						•	•	•											
MWC2-1	4.0-4.5	Soil			•		•	•	•	•				•						•			•	•						
MWC2-1	5.0-5.5	Soil					•																						•	
MWC2-1	5.5-6.0	Soil									•						•	•												
MWC2-1	8.0-8.5	Soil					•																						•	
MWC2-1	8.5-9.0	Soil									•						•	•												
MWC2-1	10.5-11.0	Soil					•																						•	
MWC2-1	11.0-11.5	Soil									•						•	•												
MWC2-1	11.5-12.0	Soil					•																						•	
MWC2-1	12.5-13.0	Soil									•						•	•												
MWC2-1R	1.0-1.5	Soil					•				•				•		•	•												
MWC2-2	1.0-1.5	Soil					•				•				•		•	•												
MWC2-2	2.5-3.0	Soil					•																						•	
MWC2-2	3.0-3.5	Soil									•						•	•	•											
MWC2-2	4.0-4.5	Soil			•		•	•	•	•				•						•				•	•					
MWC2-2	5.5-6.0	Soil					•																						•	
MWC2-2	6.0-6.5	Soil									•						•	•												
MWC2-2	8.5-9.0	Soil					•																						•	
MWC2-2	9.0-9.5	Soil									•						•	•												
MWC2-2	11.5-12.0	Soil					•																						•	
MWC2-2	12.0-12.5	Soil									•						•	•												
MWC2-2	14.0-14.5	Soil					•																						•	
MWC2-2	14.5-15.0	Soil									•						•	•												

TABLE 13-2

SITE 16 - CANS C-2 AREA
SUMMARY OF LABORATORY ANALYSES PERFORMED ON SOIL AND GROUNDWATER SAMPLES
(Sheet 4 of 6)

Boring	Depth	Matrix	Alkalinity/Acidity	Ammonia	Ammonium	Asbestos (Tot)	Ash (Tot)	SVOC	BTU Value	Cations/Anions	CEC	Cyanide (Tot)	DO (Tot)	EDB	Herb Uniq	Herbicides	Mercury	Metals	Pest/PCB	pH	Phosphorous	Potassium	Radiation	Spec. Con.	Kjeldahl Nitrogen	TOC	TPH as Diesel	TRPH	TS/TDS	VOC
MWC2-3	1.0-1.5	Soil					•	•	•	•	•				•		•	•												
MWC2-3	3.5-4.0	Soil			•		•	•	•	•				•						•				•	•					
MWC2-3	4.0-4.5	Soil					•																						•	
MWC2-3	5.0-5.5	Soil									•						•	•	•											
MWC2-3	6.5-7.0	Soil					•																						•	
MWC2-3	7.0-7.5	Soil									•						•	•												
MWC2-3	8.0-8.5	Soil					•																						•	
MWC2-3	8.5-9.0	Soil									•						•	•												
MWC2-3	9.5-10.0	Soil					•																						•	
MWC2-3	10.0-10.5	Soil									•						•	•												
MWC2-3	11.0-11.5	Soil					•																						•	
MWC2-3	12.5-13.0	Soil									•						•	•												
SSC2-1	0.0-0.5	Soil					•				•			•	•		•	•												
SSC2-2	0.0-0.5	Soil					•				•			•	•		•	•												
SSC2-3	0.0-0.5	Soil					•				•			•	•		•	•												
SSC2-4	0.0-0.5	Soil					•				•			•	•		•	•												
SSC2-5	0.0-0.5	Soil					•							•	•		•	•												
SSC2-6	0.0-0.5	Soil					•				•			•	•		•	•												
SSC2-7	0.0-0.5	Soil					•				•			•	•		•	•												
SSC2-8	0.0-0.5	Soil					•				•			•	•		•	•												
SSC2-9	0.0-0.5	Soil					•				•			•	•		•	•												
SSC2-10	0.0-0.5	Soil					•				•			•	•		•	•												
SSC2-11	0.0-0.5	Soil					•				•			•	•		•	•												
SSC2-12	0.0-0.5	Soil					•				•			•	•		•	•												
SSC2-13	0.0-0.5	Soil					•				•			•	•		•	•												
SSC2-14	0.0-0.5	Soil					•				•			•	•		•	•												
SSC2-15	0.0-0.5	Soil					•				•			•	•		•	•												
SSC2-16	0.0-0.5	Soil					•				•			•	•		•	•												
SSC2-17	0.0-0.5	Soil					•				•			•	•		•	•												

TABLE 13-2

SITE 16 - CANS C-2 AREA
SUMMARY OF LABORATORY ANALYSES PERFORMED ON SOIL AND GROUNDWATER SAMPLES
(Sheet 5 of 6)

Boring	Depth	Matrix	Alkalinity/Acidity	Ammonia	Ammonium	Asbestos (Tot)	Ash (Tot)	SVOC	BTU Value	Cations/Anions	CEC	Cyanide (Tot)	DO (Tot)	EDB	Herb Uniq	Herbicides	Mercury	Metals	Pest/PCB	pH	Phosphorous	Potassium	Radiation	Spec. Con.	Kjeldahl Nitrogen	TOC	TPH as Diesel	TRPH	TS/TDS	VOC
SSC2-18	0.0-0.5	Soil					•				•			•	•		•	•												
SSC2-19	0.0-0.5	Soil					•				•			•	•		•	•												
SSC2-20	0.0-0.5	Soil					•				•			•	•		•	•												
SSC2-21	0.0-0.5	Soil					•				•			•	•		•	•												
SSC2-22	0.0-0.5	Soil					•				•			•	•		•	•												
SSC2-23	0.0-0.5	Soil					•				•			•	•		•	•												
SSC2-24	0.0-0.5	Soil					•				•			•	•		•	•												
SSC2-25	0.0-0.5	Soil					•				•			•	•		•	•												
SSC2-26	0.0-0.5	Soil					•				•			•	•		•	•												
SSC2-27	0.0-0.5	Soil					•				•			•	•		•	•												
SSC2-28	0.0-0.5	Soil					•				•			•	•		•	•												
SSC2-29	0.0-0.5	Soil					•				•			•	•		•	•												
SSC2-30	0.0-0.5	Soil					•				•			•	•		•	•												
SSC2-31	0.0-0.5	Soil					•				•			•	•		•	•												
SSC2-32	0.0-0.5	Soil					•				•			•	•		•	•												
SSC2-33	0.0-0.5	Soil					•				•			•	•		•	•												
SSC2-34	0.0-0.5	Soil					•				•			•	•		•	•												
SSC2-35	0.0-0.5	Soil					•				•			•	•		•	•												
SSC2-36	0.0-0.5	Soil					•				•			•	•		•	•												
SSC2-37	0.0-0.5	Soil					•				•			•	•		•	•												
SSC2-38	0.0-0.5	Soil					•				•			•	•		•	•												
SSC2-39	0.0-0.5	Soil					•				•			•	•		•	•												
SSC2-40	0.0-0.5	Soil					•				•			•	•		•	•												
SSC2-41	0.0-0.5	Soil					•				•			•	•		•	•												
SSC2-42	0.0-0.5	Soil					•				•			•	•		•	•												
SSC2-43	0.0-0.5	Soil					•				•			•	•		•	•												
SSC2-44	0.0-0.5	Soil					•				•			•	•		•	•												
SSC2-45	0.0-0.5	Soil					•				•			•	•		•	•												
SSC2-46	0.0-0.5	Soil					•				•			•	•		•	•												

TABLE 13-2

SITE 16 - CANS C-2 AREA
SUMMARY OF LABORATORY ANALYSES PERFORMED ON SOIL AND GROUNDWATER SAMPLES
(Sheet 6 of 6)

Boring	Depth	Matrix	Alkalinity/Acidity	Ammonia	Ammonium	Asbestos (Tot)	Ash (Tot)	SVOC	BTU Value	Cations/Anions	CEC	Cyanide (Tot)	DO (Tot)	EDB	Herb Uniq	Herbicides	Mercury	Metals	Pest/PCB	pH	Phosphorous	Potassium	Radiation	Spec. Con.	Kjeldahl Nitrogen	TOC	TPH as Diesel	TRPH	TS/TDS	VOC
SSC2-47	0.0-0.5	Soil					•				•			•	•		•	•												
SSC2-48	0.0-0.5	Soil					•				•			•	•		•	•												
SSC2-49	0.0-0.5	Soil					•				•			•	•		•	•												
SSC2-50	0.0-0.5	Soil					•				•			•	•		•	•												
SSC2-51	0.0-0.5	Soil					•				•			•	•		•	•												
SSC2-52	0.0-0.5	Soil					•				•			•	•		•	•												
SSC2-53	0.0-0.5	Soil					•				•			•	•		•	•												
SSC2-54	0.0-0.5	Soil					•				•			•	•		•	•												
SSC2-55	0.0-0.5	Soil					•				•			•	•		•	•												
	Summary	Soil			9		8	100	9	11	11	100			67	67		100	101	12	9				9	10				41
221	0.0	Water																												•
MWC2-1	0.0	Water	•				•		•		•	•						•	•	•				•		•		•	•	•
MWC2-2	0.0	Water	•				•		•		•	•						•	•	•				•		•		•	•	•
MWC2-3	0.0	Water	•				•		•		•	•						•	•	•				•		•		•	•	•
	Summary	Water	3				3		3		3	3						3	3	3				3		3		3	3	4

Notes:

200-series boring numbers indicate travel blanks

Analysis	Methods	Matrix
DO	DO	water
Misc		
Phosphorus	ASA #9 24-2.3	soil
TKN	ASA #9 31-1	soil
TDS	EPA 160.1	water
Nitrate	EPA 300.0	soil
Chloride	EPA 300.0 (Mod)	soil
Acidity	EPA 305.1	water
Alkalinity	EPA 310.1	water
Foaming Agents	EPA 425.1	water
Ammonium	EPA/CE81-1	soil

Analysis	Methods	Matrix
Hardness	SM 314A	water
BTU	ASTM D3286-73	soil
Spec Con	EPA 120.1	water
Metals	EPA 200.7	water
Metals	EPA 6010	soil
Tot Cyanide	EPA 335.2	soil
Tot Cyanide	EPA 9010	soil
TRPH	EPA 418.1	water
Pest/PCB	EPA 8080	soil
Pest/PCB	EPA 608	water

Analysis	Methods	Matrix
Herbicides	EPA 8150	soil
Herb Uniq	EPA 632	soil
Herb Uniq	EPA 633	soil
Herb Uniq	LUNDGREN	soil
pH	EPA 9045	soil
Ash	EPA SM302H	soil
TOC	EPA/CE 81-1	soil
CEC	USBR 514.8-4,6	soil
VOC	EPA 624	water
VOC	EPA 8240	soil
SVOC	EPA 8270	soil

TABLE 13-3

SITE 16 - CANS C-2 AREA
RESULTS FOR VOLATILE ORGANIC COMPOUNDS DETECTED IN SOIL SAMPLES
(Sheet 1 of 3)

Parameter Reported	BC2-4 07/24/90 2-2.5 ft	BC2-4 07/24/90 5.5-6 ft	BC2-4 07/24/90 8.5-9 ft	BC2-4 07/24/90 11.5-12 ft	BC2-4 07/24/90 14-14.5 ft	BC2-5 07/24/90 2.5-3 ft	BC2-5 07/24/90 5.5-6 ft
Methylene Chloride (ug/kg)	8	11	9	6	6	7	6
Acetone (ug/kg)	12	38 B	36	18	50	50	23
Carbon Disulfide (ug/kg)	<5.00	38	<6.00	<6.00	2	<5.00	<6.00
1,1-Dichloroethane (ug/kg)	<5.00	<6.00	<6.00	<6.00	<7.00	<5.00	<6.00
1,2-Dichloroethene (total) (ug/kg)	<5.00	<6.00	<6.00	<6.00	<7.00	<5.00	<6.00
2-Butanone (ug/kg)	<10.0	<12.0	5	<13.0	7	3	<12.0
Toluene (ug/kg)	8	6	9	20	3	21	6
1,4-Dichlorobenzene (ug/kg)	<5.00	3	<6.00	<6.00	<7.00	<5.00	<6.00
1,2-Dichlorobenzene (ug/kg)	<5.00	11	3	<6.00	<7.00	<5.00	<6.00

Parameter Reported	BC2-5 07/24/90 8.5-9 ft	BC2-5 07/24/90 11.5-12 ft	BC2-5 07/24/90 14.5-15 ft	BC2-6 07/25/90 3.5-4 ft	BC2-6 07/25/90 7-7.5 ft	BC2-6 07/25/90 11-11.5 ft	BC2-6 07/25/90 13-13.5 ft
Methylene Chloride (ug/kg)	8	6	7	12	12	10	<6.00
Acetone (ug/kg)	25	80	14	14	21	<12.0	13
Carbon Disulfide (ug/kg)	<6.00	<6.00	1	<6.00	<6.00	<6.00	<6.00
1,1-Dichloroethane (ug/kg)	<6.00	<6.00	<6.00	<6.00	<6.00	<6.00	<6.00
1,2-Dichloroethene (total) (ug/kg)	<6.00	<6.00	<6.00	<6.00	<6.00	<6.00	<6.00
2-Butanone (ug/kg)	3	<12.0	3	<12.0	<12.0	<12.0	<12.0
Toluene (ug/kg)	<6.00	2	4	200	41	20	17
1,4-Dichlorobenzene (ug/kg)	<6.00	<6.00	<6.00	NA	NA	NA	NA
1,2-Dichlorobenzene (ug/kg)	<6.00	<6.00	<6.00	NA	NA	NA	NA

Notes: NA = Not Analyzed
< = Detection Limit
ug/kg = micrograms per kilogram
Data not validated by JMM

TABLE 13-3

SITE 16 - CANS C-2 AREA
RESULTS FOR VOLATILE ORGANIC COMPOUNDS DETECTED IN SOIL SAMPLES
(Sheet 2 of 3)

Parameter Reported	BC2-7 07/24/90 2.5-3 ft	BC2-7 07/24/90 7-7.5 ft	BC2-7 07/24/90 11-11.5 ft	BC2-7 07/24/90 13.5-14 ft	BC2-8 07/25/90 3.5-4 ft	BC2-8 07/25/90 7-7.5 ft	BC2-8 07/25/90 11-11.5 ft
Methylene Chloride (ug/kg)	8	10	15	9	<5.00	<6.00	7
Acetone (ug/kg)	32	45	17	110	<10.0	<13.0	17
Carbon Disulfide (ug/kg)	<5.00	<6.00	<6.00	2	<5.00	<6.00	<6.00
1,1-Dichloroethane (ug/kg)	<5.00	5	<6.00	<6.00	<5.00	<6.00	<6.00
1,2-Dichloroethene (total) (ug/kg)	<5.00	4	<6.00	4	<5.00	<6.00	17
2-Butanone (ug/kg)	<11.0	<12.0	<12.0	5	<10.0	<13.0	<12.0
Toluene (ug/kg)	<5.00	4	8	5	10	11	65
1,4-Dichlorobenzene (ug/kg)	<5.00	<6.00	<6.00	<6.00	NA	NA	NA
1,2-Dichlorobenzene (ug/kg)	<5.00	<6.00	<6.00	<6.00	NA	NA	NA

Parameter Reported	BC2-8 07/25/90 14-14.5 ft	BC2-9 07/25/90 3.5-4 ft	BC2-9 07/25/90 7-7.5 ft	BC2-9 07/25/90 11-11.5 ft	BC2-9 07/25/90 13-13.5 ft	MWC2-1 07/25/90 2-2.5 ft	MWC2-1 07/25/90 5-5.5 ft
Methylene Chloride (ug/kg)	6	7	9	10	10	8	17
Acetone (ug/kg)	16	<11.0	<13.0	21	17	<10.0	<12.0
Carbon Disulfide (ug/kg)	<6.00	<6.00	<6.00	<6.00	7	<5.00	<6.00
1,1-Dichloroethane (ug/kg)	<6.00	<6.00	<6.00	<6.00	<6.00	<5.00	<6.00
1,2-Dichloroethene (total) (ug/kg)	<6.00	<6.00	<6.00	<6.00	<6.00	<5.00	<6.00
2-Butanone (ug/kg)	<13.0	<11.0	<13.0	<12.0	<12.0	<10.0	<12.0
Toluene (ug/kg)	36	7	18	32	32	6	<6.00
1,4-Dichlorobenzene (ug/kg)	NA	NA	NA	NA	NA	NA	NA
1,2-Dichlorobenzene (ug/kg)	NA	NA	NA	NA	NA	NA	NA

Notes: NA = Not Analyzed
< = Detection Limit
ug/kg = micrograms per kilogram
Data not validated by JMM

TABLE 13-3

SITE 16 - CANS C-2 AREA
RESULTS FOR VOLATILE ORGANIC COMPOUNDS DETECTED IN SOIL SAMPLES
(Sheet 3 of 3)

Parameter Reported	MWC2-1 07/25/90 8-8.5 ft	MWC2-1 07/25/90 10.5-11 ft	MWC2-1 07/25/90 11.5-12 ft	MWC2-2 07/24/90 2.5-3 ft	MWC2-2 07/24/90 5.5-6 ft	MWC2-2 07/24/90 8.5-9 ft	MWC2-2 07/24/90 11.5-12 ft
Methylene Chloride (ug/kg)	15	9	16	11	23	22	11
Acetone (ug/kg)	<13.0	23	48	39	20	31	60
Carbon Disulfide (ug/kg)	<6.00	<7.00	17	<5.00	<6.00	<6.00	<6.00
1,1-Dichloroethane (ug/kg)	<6.00	<7.00	<7.00	<5.00	<6.00	<6.00	<6.00
1,2-Dichloroethene (total) (ug/kg)	<6.00	<7.00	<7.00	<5.00	<6.00	<6.00	<6.00
2-Butanone (ug/kg)	<13.0	<14.0	<14.0	<10.0	<12.0	<13.0	<12.0
Toluene (ug/kg)	<6.00	<7.00	60	<5.00	<6.00	<6.00	2
1,4-Dichlorobenzene (ug/kg)	NA	NA	NA	<5.00	<6.00	<6.00	<6.00
1,2-Dichlorobenzene (ug/kg)	NA	NA	NA	<5.00	<6.00	<6.00	<6.00

Parameter Reported	MWC2-2 07/24/90 14-14.5 ft	MWC2-3 07/25/90 4-4.5 ft	MWC2-3 07/25/90 6.5-7 ft	MWC2-3 07/25/90 8-8.5 ft	MWC2-3 07/25/90 9.5-10 ft	MWC2-3 07/25/90 11-11.5 ft
Methylene Chloride (ug/kg)	11	13	7	9	12	8
Acetone (ug/kg)	17	28	<12.0	<13.0	93	16
Carbon Disulfide (ug/kg)	<6.00	<6.00	<6.00	<7.00	<6.00	<6.00
1,1-Dichloroethane (ug/kg)	<6.00	<6.00	<6.00	<7.00	<6.00	<6.00
1,2-Dichloroethene (total) (ug/kg)	<6.00	<6.00	<6.00	<7.00	<6.00	<6.00
2-Butanone (ug/kg)	6	<12.0	<12.0	<13.0	<12.0	<12.0
Toluene (ug/kg)	3	<6.00	<6.00	<7.00	47	10
1,4-Dichlorobenzene (ug/kg)	<6.00	NA	NA	NA	NA	NA
1,2-Dichlorobenzene (ug/kg)	<6.00	NA	NA	NA	NA	NA

Notes: NA = Not Analyzed
< = Detection Limit
ug/kg = micrograms per kilogram
Data not validated by JMM

TABLE 13-4

SITE 16 - CANS C-2 AREA
RESULTS FOR SEMIVOLATILE COMPOUNDS DETECTED IN SOIL SAMPLES
(Sheet 1 of 5)

Parameter Reported	BC2-4 07/24/90 5.5-6 ft	BC2-4 07/24/90 14-14.5 ft	MWC2-2 07/24/90 5.5-6 ft	MWC2-2 07/24/90 11.5-12 ft	MWC2-2 07/24/90 14-14.5 ft	SSC2-1 07/24/90 0-0.5 ft	SSC2-11 07/24/90 0-0.5 ft
1,2-Dichlorobenzene (ug/kg)	200	<430	<340	<410	<410	<1300	<3300
2,4-Dimethylphenol (ug/kg)	<410	<430	<340	<410	<410	<1300	<3300
Naphthalene (ug/kg)	<410	<430	<340	<410	<410	<1300	<3300
2-Methylnaphthalene (ug/kg)	<410	<430	<340	<410	<410	<1300	<3300
Acenaphthene (ug/kg)	<410	45	<340	<410	<410	<1300	<3300
Fluorene (ug/kg)	<410	<430	<340	<410	<410	<1300	<3300
Phenanthrene (ug/kg)	<410	570	<340	<410	<410	<1300	<3300
Anthracene (ug/kg)	<410	250	<340	<410	<410	<1300	<3300
Di-n-butylphthalate (ug/kg)	<410	170	<340	<410	<410	3000	<3300
Fluoranthene (ug/kg)	<410	1300	<340	<410	<410	<1300	<3300
Pyrene (ug/kg)	<410	2200	<340	<410	<410	<1300	<3300
Benzo(a)anthracene (ug/kg)	<410	690	<340	<410	<410	<1300	<3300
Chrysene (ug/kg)	<410	730	<340	<410	<410	<1300	<3300
bis(2-Ethylhexyl)phthalate (ug/kg)	<410	53	59	400	66	1900	4400
Benzo(b)fluoranthene (ug/kg)	<410	820	<340	<410	<410	<1300	<3300
Benzo(k)fluoranthene (ug/kg)	<410	340	<340	<410	<410	<1300	<3300
Benzo(a)pyrene (ug/kg)	<410	970	<340	<410	<410	<1300	<3300
Indeno(1,2,3-cd)pyrene (ug/kg)	<410	560	<340	<410	<410	<1300	<3300
Dibenz(a,h)anthracene (ug/kg)	<410	96	<340	<410	<410	<1300	<3300
Benzo(g,h,i)perylene (ug/kg)	<410	650	<340	<410	<410	<1300	<3300

Notes: NA = Not Analyzed
< = Detection Limit
ug/kg = micrograms per kilogram
Data not validated by JMM

TABLE 13-4

SITE 16 - CANS C-2 AREA
RESULTS FOR SEMIVOLATILE COMPOUNDS DETECTED IN SOIL SAMPLES
(Sheet 2 of 5)

Parameter Reported	SSC2-14 07/24/90 0-0.5 ft	SSC2-15 07/24/90 0-0.5 ft	SSC2-18 07/24/90 0-0.5 ft	SSC2-2 07/24/90 0-0.5 ft	SSC2-21 07/24/90 0-0.5 ft	SSC2-23 07/24/90 0-0.5 ft	SSC2-24 07/24/90 0-0.5 ft
1,2-Dichlorobenzene (ug/kg)	<3300	<1300	<1300	<1300	<1300	<660	<660
2,4-Dimethylphenol (ug/kg)	<3300	<1300	<1300	<1300	<1300	1100	<660
Naphthalene (ug/kg)	<3300	<1300	<1300	<1300	<1300	<660	<660
2-Methylnaphthalene (ug/kg)	<3300	<1300	<1300	<1300	<1300	<660	<660
Acenaphthene (ug/kg)	<3300	<1300	<1300	<1300	<1300	<660	<660
Fluorene (ug/kg)	<3300	<1300	<1300	<1300	<1300	<660	<660
Phenanthrene (ug/kg)	<3300	<1300	<1300	<1300	<1300	<660	<660
Anthracene (ug/kg)	<3300	<1300	<1300	<1300	<1300	<660	<660
Di-n-butylphthalate (ug/kg)	<3300	<1300	<1300	<1300	<1300	1300	<660
Fluoranthene (ug/kg)	<3300	<1300	<1300	<1300	<1300	<660	<660
Pyrene (ug/kg)	<3300	<1300	<1300	<1300	<1300	<660	<660
Benzo(a)anthracene (ug/kg)	<3300	<1300	<1300	<1300	<1300	<660	<660
Chrysene (ug/kg)	<3300	<1300	<1300	<1300	<1300	<660	<660
bis(2-Ethylhexyl)phthalate (ug/kg)	12000	2700	2400	12000	3200	8100	1800
Benzo(b)fluoranthene (ug/kg)	<3300	<1300	<1300	<1300	<1300	<660	<660
Benzo(k)fluoranthene (ug/kg)	<3300	<1300	<1300	<1300	<1300	<660	<660
Benzo(a)pyrene (ug/kg)	<3300	<1300	<1300	<1300	<1300	<660	<660
Indeno(1,2,3-cd)pyrene (ug/kg)	<3300	<1300	<1300	<1300	<1300	<660	<660
Dibenz(a,h)anthracene (ug/kg)	<3300	<1300	<1300	<1300	<1300	<660	<660
Benzo(g,h,i)perylene (ug/kg)	<3300	<1300	<1300	<1300	<1300	<660	<660

Notes: NA = Not Analyzed
< = Detection Limit
ug/kg = micrograms per kilogram
Data not validated by JMM

TABLE 13-4

SITE 16 - CANS C-2 AREA
RESULTS FOR SEMIVOLATILE COMPOUNDS DETECTED IN SOIL SAMPLES
(Sheet 3 of 5)

Parameter Reported	SSC2-27 07/24/90 0-0.5 ft	SSC2-28 07/24/90 0-0.5 ft	SSC2-33 07/24/90 0-0.5 ft	SSC2-35 07/24/90 0-0.5 ft	SSC2-36 07/24/90 0-0.5 ft	SSC2-38 07/24/90 0-0.5 ft	SSC2-40 07/24/90 0-0.5 ft
1,2-Dichlorobenzene (ug/kg)	<1300	<13000	<1400	<660	<660	<3300	<3300
2,4-Dimethylphenol (ug/kg)	<1300	<13000	<1400	<660	<660	<3300	<3300
Naphthalene (ug/kg)	<1300	<13000	<1400	<660	<660	<3300	<3300
2-Methylnaphthalene (ug/kg)	<1300	<13000	<1400	<660	<660	<3300	<3300
Acenaphthene (ug/kg)	<1300	<13000	<1400	<660	<660	<3300	<3300
Fluorene (ug/kg)	<1300	<13000	<1400	<660	<660	<3300	<3300
Phenanthrene (ug/kg)	<1300	<13000	<1400	<660	<660	<3300	<3300
Anthracene (ug/kg)	<1300	<13000	<1400	<660	<660	<3300	<3300
Di-n-butylphthalate (ug/kg)	<1300	<13000	<1400	<660	<660	<3300	<3300
Fluoranthene (ug/kg)	<1300	<13000	<1400	<660	<660	<3300	<3300
Pyrene (ug/kg)	<1300	<13000	<1400	<660	<660	<3300	<3300
Benzo(a)anthracene (ug/kg)	<1300	<13000	<1400	<660	<660	<3300	<3300
Chrysene (ug/kg)	<1300	<13000	<1400	<660	<660	<3300	<3300
bis(2-Ethylhexyl)phthalate (ug/kg)	5900	90000	1600	1700	2500	3500	3700
Benzo(b)fluoranthene (ug/kg)	<1300	<13000	<1400	<660	<660	<3300	<3300
Benzo(k)fluoranthene (ug/kg)	<1300	<13000	<1400	<660	<660	<3300	<3300
Benzo(a)pyrene (ug/kg)	<1300	<13000	<1400	<660	<660	<3300	<3300
Indeno(1,2,3-cd)pyrene (ug/kg)	<1300	<13000	<1400	<660	<660	<3300	<3300
Dibenz(a,h)anthracene (ug/kg)	<1300	<13000	<1400	<660	<660	<3300	<3300
Benzo(g,h,i)perylene (ug/kg)	<1300	<13000	<1400	<660	<660	<3300	<3300

Notes: NA = Not Analyzed
Notes: NA = Not Analyzed
< = Detection Limit
ug/kg = micrograms per kilogram
Data not validated by JMM

TABLE 13-4

SITE 16 - CANS C-2 AREA
RESULTS FOR SEMIVOLATILE COMPOUNDS DETECTED IN SOIL SAMPLES
(Sheet 4 of 5)

Parameter Reported	SSC2-41 07/26/90 0-0.5 ft	SSC2-44 07/26/90 0-0.5 ft	SSC2-45 07/24/90 0-0.5 ft	SSC2-46 07/24/90 0-0.5 ft	SSC2-47 07/26/90 0-0.5 ft	SSC2-48 07/26/90 0-0.5 ft	SSC2-49 07/26/90 0-0.5 ft
1,2-Dichlorobenzene (ug/kg)	<690	<1300	<670	<690	<690	<690	<690
2,4-Dimethylphenol (ug/kg)	<690	<1300	<670	<690	<690	<690	<690
Naphthalene (ug/kg)	<690	<1300	<670	<690	<690	74	120
2-Methylnaphthalene (ug/kg)	89	<1300	<670	<690	100	130	250
Acenaphthene (ug/kg)	<690	<1300	<670	<690	<690	<690	<690
Fluorene (ug/kg)	<690	<1300	<670	<690	<690	70	120
Phenanthrene (ug/kg)	170	<1300	90	<690	230	180	260
Anthracene (ug/kg)	<690	<1300	<670	<690	<690	<690	<690
Di-n-butylphthalate (ug/kg)	<690	<1300	<670	<690	<690	<690	<690
Fluoranthene (ug/kg)	<690	<1300	<670	<690	<690	<690	<690
Pyrene (ug/kg)	<690	150	<670	<690	100	<690	<690
Benzo(a)anthracene (ug/kg)	<690	<1300	<670	<690	<690	<690	<690
Chrysene (ug/kg)	<690	<1300	<670	<690	160	<690	140
bis(2-Ethylhexyl)phthalate (ug/kg)	<690	<1300	<670	78	<690	<690	<690
Benzo(b)fluoranthene (ug/kg)	<690	<1300	<670	<690	<690	<690	<690
Benzo(k)fluoranthene (ug/kg)	<690	<1300	<670	<690	<690	<690	<690
Benzo(a)pyrene (ug/kg)	<690	<1300	<670	<690	<690	<690	<690
Indeno(1,2,3-cd)pyrene (ug/kg)	<690	<1300	<670	<690	<690	<690	<690
Dibenz(a,h)anthracene (ug/kg)	<690	<1300	<670	<690	<690	<690	<690
Benzo(g,h,i)perylene (ug/kg)	<690	<1300	<670	<690	<690	<690	<690

Notes: NA = Not Analyzed
< = Detection Limit
ug/kg = micrograms per kilogram
Data not validated by JMM

TABLE 13-4

SITE 16 - CANS C-2 AREA
RESULTS FOR SEMIVOLATILE COMPOUNDS DETECTED IN SOIL SAMPLES
(Sheet 5 of 5)

Parameter Reported	SSC2-50 07/26/90 0-0.5 ft	SSC2-51 07/26/90 0-0.5 ft	SSC2-52 07/26/90 0-0.5 ft	SSC2-53 07/26/90 0-0.5 ft	SSC2-54 07/26/90 0-0.5 ft	SSC2-55 07/26/90 0-0.5 ft	SSC2-9 07/24/90 0-0.5 ft
1,2-Dichlorobenzene (ug/kg)	<690	<670	<690	<690	<700	<700	<3300
2,4-Dimethylphenol (ug/kg)	<690	<670	<690	<690	<700	<700	<3300
Naphthalene (ug/kg)	130	89	130	<690	<700	<700	<3300
2-Methylnaphthalene (ug/kg)	270	160	210	110	<700	<700	<3300
Acenaphthene (ug/kg)	<690	<670	<690	<690	<700	<700	<3300
Fluorene (ug/kg)	110	92	<690	<690	<700	<700	<3300
Phenanthrene (ug/kg)	260	200	210	<690	92	110	<3300
Anthracene (ug/kg)	<690	<670	<690	<690	<700	<700	<3300
Di-n-butylphthalate (ug/kg)	<690	<670	<690	<690	<700	<700	<3300
Fluoranthene (ug/kg)	<690	<670	<690	<690	<700	<700	<3300
Pyrene (ug/kg)	110	<670	<690	<690	<700	<700	<3300
Benzo(a)anthracene (ug/kg)	<690	<670	<690	<690	<700	<700	<3300
Chrysene (ug/kg)	140	<670	<690	<690	<700	<700	<3300
bis(2-Ethylhexyl)phthalate (ug/kg)	<690	<670	<690	<690	<700	110	3300
Benzo(b)fluoranthene (ug/kg)	<690	<670	<690	<690	<700	<700	<3300
Benzo(k)fluoranthene (ug/kg)	<690	<670	<690	<690	<700	<700	<3300
Benzo(a)pyrene (ug/kg)	<690	<670	<690	<690	<700	<700	<3300
Indeno(1,2,3-cd)pyrene (ug/kg)	<690	<670	<690	<690	<700	<700	<3300
Dibenz(a,h)anthracene (ug/kg)	<690	<670	<690	<690	<700	<700	<3300
Benzo(g,h,i)perylene (ug/kg)	<690	<670	<690	<690	<700	<700	<3300

Notes: NA = Not Analyzed
< = Detection Limit
ug/kg = micrograms per kilogram
Data not validated by JMM

TABLE 13-5

SITE 16 - CANS C-2 AREA
RESULTS FOR PESTICIDE AND PCB COMPOUNDS AND GLYPHOSATE
DETECTED IN SOIL SAMPLES
(Sheet 1 of 3)

Parameter Reported	BC2-6 07/25/90 9.5-10 ft	BC2-6R 07/09/90 1-1.5 ft	BC2-8R 07/09/90 1-1.5 ft	MWC2-1 07/25/90 0.5-1 ft	MWC2-2 07/24/90 9-9.5 ft	SSC2-12 07/24/90 0-0.5 ft	SSC2-13 07/24/90 0-0.5 ft
Pesticide/PCB Compounds							
alpha-BHC (ug/kg)	<1.20	3.7	2.3	<1.00	3	<20.0	<10.0
beta-BHC (ug/kg)	<1.20	<1.10	3.1	<1.00	<1.30	<20.0	<10.0
gamma-BHC (Lindane) (ug/kg)	<1.20	3.8	<1.00	<1.00	<1.30	<20.0	<10.0
4,4'-DDD (ug/kg)	4.5	3.7	11	6.1	10	<40.0	<20.0
4,4'-DDE (ug/kg)	2.5	2.2	7.8	<2.00	<2.60	<40.0	<20.0
4,4'-DDT (ug/kg)	69	31	140	14	<2.60	<40.0	<20.0
Aroclor-1248 (ug/kg)	<30.0	<28.0	<26.0	<26.0	<32.0	<500	<250
Aroclor-1254 (ug/kg)	<59	<56	<52	<51	<65	<1000	<500
Aroclor-1260 (ug/kg)	<59	<56	<52	<51	<65	2300	1600

	SSC2-15 07/24/90 0-0.5 ft	SSC2-35 07/24/90 0-0.5 ft
Glyphosate (ug/g)	0.8	1

Notes: NA = Not Analyzed
< = Detection Limit
ug/g = micrograms per gram
ug/kg = micrograms per kilogram
Data not validated by JMM

TABLE 13-5

SITE 16 - CANS C-2 AREA
RESULTS FOR PESTICIDE AND PCB COMPOUNDS AND GLYPHOSATE
DETECTED IN SOIL SAMPLES
(Sheet 2 of 3)

Parameter Reported	SSC2-21 07/24/90 0-0.5 ft	SSC2-22 07/24/90 0-0.5 ft	SSC2-23 07/24/90 0-0.5 ft	SSC2-24 07/24/90 0-0.5 ft	SSC2-25 07/24/90 0-0.5 ft	SSC2-28 07/24/90 0-0.5 ft	SSC2-31 07/24/90 0-0.5 ft
Pesticide/PCB Compounds							
alpha-BHC (ug/kg)	<10.0	<10.0	<100	<10.0	<10.0	<50	<10.0
beta-BHC (ug/kg)	<10.0	<10.0	<100	<10.0	<10.0	<50	<10.0
gamma-BHC (Lindane) (ug/kg)	<10.0	<10.0	<100	<10.0	<10.0	<50	<10.0
4,4'-DDD (ug/kg)	<20.0	<20.0	<200	<20.0	<20.0	<100	<20.0
4,4'-DDE (ug/kg)	<20.0	<20.0	<200	<20.0	<20.0	<100	<20.0
4,4'-DDT (ug/kg)	<20.0	<20.0	<200	<20.0	65	<100	<20.0
Aroclor-1248 (ug/kg)	<250	<25.0	<2500	4600	<250	<1300	<250
Aroclor-1254 (ug/kg)	<500	<500	23000	<500	<500	19000	<500
Aroclor-1260 (ug/kg)	1500	3500	<5000	<500	<500	<2500	7300

Notes: NA = Not Analyzed
< = Detection Limit
ug/g = micrograms per gram
ug/kg = micrograms per kilogram
Data not validated by JMM

TABLE 13-5

SITE 16 - CANS C-2 AREA
RESULTS FOR PESTICIDE AND PCB COMPOUNDS AND GLYPHOSATE
DETECTED IN SOIL SAMPLES
(Sheet 3 of 3)

Parameter Reported	SSC2-32 07/24/90 0-0.5 ft	SSC2-38 07/24/90 0-0.5 ft	SSC2-39 07/24/90 0-0.5 ft
Pesticide/PCB Compounds			
alpha-BHC (ug/kg)	<5.00	<10.0	<10.0
beta-BHC (ug/kg)	<5.00	<10.0	<10.0
gamma-BHC (Lindane) (ug/kg)	<5.00	<10.0	<10.0
4,4'-DDD (ug/kg)	<10.0	<20.0	<20.0
4,4'-DDE (ug/kg)	<10.0	49	20
4,4'-DDT (ug/kg)	<10.0	180	<20.0
Aroclor-1248 (ug/kg)	<120	<250	<250
Aroclor-1254 (ug/kg)	<250	<500	<500
Aroclor-1260 (ug/kg)	4000	<500	<500

Notes: NA = Not Analyzed
< = Detection Limit
ug/g = micrograms per gram
ug/kg = micrograms per kilogram
Data not validated by JMM

TABLE 13-6

SITE 16 - CANS C-2 AREA
RESULTS FOR METALS DETECTED IN SOIL SAMPLES
(Sheet 1 of 15)

Parameter Reported	BC2-4 07/24/90 0.5-1 ft	BC2-4 07/24/90 5-5.5 ft	BC2-4 07/24/90 9.5-10 ft	BC2-4 07/24/90 13-13.5 ft	BC2-5 07/24/90 0.5-1 ft	BC2-5 07/24/90 7-7.5 ft	BC2-5 07/24/90 13.5-14 ft
Aluminum (mg/kg)	3910	3740	5060	11000	4480	4260	4250
Antimony (mg/kg)	<6.20	<7.30	<7.40	<8.60	<6.50	<7.40	<7.30
Arsenic (mg/kg)	<10.0	<12.0	<12.0	<14.0	<11.0	<12.0	<12.0
Barium (mg/kg)	<20.0	26	29	46	23	<25.0	<24.0
Beryllium (mg/kg)	<1.00	<1.20	<1.20	<1.40	<1.10	<1.20	<1.20
Cadmium (mg/kg)	<1.00	<1.20	<1.20	<1.40	<1.10	<1.20	<1.20
Calcium (mg/kg)	2200	2000	2000	4200	1700	1800	1300
Chromium (mg/kg)	26	24	25	44	25	22	22
Cobalt (mg/kg)	<5.10	<6.10	<6.20	8.9	<5.40	<6.20	<6.10
Copper (mg/kg)	5.3	8.9	<6.20	68	6.9	7.6	7.6
Iron (mg/kg)	7360	6000	8200	18700	7740	7040	6850
Lead (mg/kg)	<5.10	<6.10	<6.20	23	<5.40	<6.20	<6.10
Magnesium (mg/kg)	2000	1800	2600	5300	2500	2300	1900
Manganese (mg/kg)	76	86	92	240	84	92	86
Molybdenum (mg/kg)	<5.10	<6.10	<6.20	<7.20	<5.40	<6.20	<6.10
Nickel (mg/kg)	20	20	26	50	26	23	18
Potassium (mg/kg)	620	<610	880	1800	740	690	900
Silver (mg/kg)	<10.0	<12.0	<12.0	<14.0	<11.0	<12.0	<12.0
Sodium (mg/kg)	<5.10	<6.10	<6.20	<7.20	<5.40	<6.20	<6.10
Thallium (mg/kg)	<510	<610	<620	1900	<540	<620	<610
Titanium (mg/kg)	410	430	420	470	320	350	270
Vanadium (mg/kg)	16	16	19	34	15	15	15
Zinc (mg/kg)	15	17	19	75	18	17	17

Notes NA = Not Analyzed
< = Detection Limit
mg/kg = milligrams per kilogram
Data not validated by JMM

TABLE 13-6

SITE 16 - CANS C-2 AREA
RESULTS FOR METALS DETECTED IN SOIL SAMPLES
(Sheet 2 of 15)

Parameter Reported	BC2-5R 07/24/90 1-1.5 ft	BC2-6 07/25/90 0.5-1 ft	BC2-6 07/25/90 5-5.5 ft	BC2-6 07/25/90 9.5-10 ft	BC2-6 07/25/90 14-14.5 ft	BC2-6R 07/09/90 1-1.5 ft	BC2-7 07/24/90 0.5-1 ft
Aluminum (mg/kg)	6630	3800	3970	4280	7850	4820	4880
Antimony (mg/kg)	<6.90	<6.20	<7.20	<7.10	<7.50	<6.70	<6.90
Arsenic (mg/kg)	<12.0	<10.0	<12.0	<12.0	<12.0	<11.0	<12.0
Barium (mg/kg)	45	23	<24.0	<24.0	36	<22.0	27
Beryllium (mg/kg)	<1.20	<1.00	<1.20	<1.20	<1.20	<1.10	<1.20
Cadmium (mg/kg)	<1.20	<1.00	<1.20	<1.20	<1.20	<1.10	<1.20
Calcium (mg/kg)	2400	1900	1700	2500	6100	2000	2100
Chromium (mg/kg)	31	21	25	25	34	24	26
Cobalt (mg/kg)	7	<5.20	<6.00	<5.90	<6.20	<5.60	<5.80
Copper (mg/kg)	14	27	6	8.4	16	17	<5.80
Iron (mg/kg)	11000	6140	7380	6890	12500	8240	7870
Lead (mg/kg)	6.4	<5.20	6.5	<5.90	<6.20	<5.60	<5.80
Magnesium (mg/kg)	3500	1700	2000	2100	3400	2500	2400
Manganese (mg/kg)	170	78	75	84	140	90	100
Molybdenum (mg/kg)	<5.80	<5.20	<6.00	<5.90	<6.20	<5.60	<5.80
Nickel (mg/kg)	39	19	24	20	35	26	26
Potassium (mg/kg)	1100	<520	<600	<590	1200	630	640
Silver (mg/kg)	<12.0	<10.0	<12.0	<12.0	<12.0	<11.0	<12.0
Sodium (mg/kg)	<5.80	<5.20	<6.00	<5.90	<6.20	<5.60	<5.80
Thallium (mg/kg)	<580	<520	<600	<590	790	<560	<580
Titanium (mg/kg)	320	360	300	360	430	360	390
Vanadium (mg/kg)	22	15	17	17	25	17	16
Zinc (mg/kg)	30	23	20	17	32	23	17

Notes: NA = Not Analyzed
< = Detection Limit
mg/kg = milligrams per kilogram
Data not validated by JMM

TABLE 13-6

SITE 16 - CANS C-2 AREA
RESULTS FOR METALS DETECTED IN SOIL SAMPLES
(Sheet 3 of 15)

Parameter Reported	BC2-7 07/24/90 5-5.5 ft	BC2-7 07/24/90 9.5-10 ft	BC2-7 07/24/90 14-14.5 ft	BC2-8 07/25/90 0.5-1 ft	BC2-8 07/25/90 5-5.5 ft	BC2-8 07/25/90 9.5-10 ft	BC2-8 07/25/90 14.5-15 ft
Aluminum (mg/kg)	4200	5380	4620	3120	3150	5010	4880
Antimony (mg/kg)	<7.30	<7.50	<7.10	<6.20	<7.40	<7.30	<7.30
Arsenic (mg/kg)	<12.0	<12.0	<12.0	<10.0	<12.0	<12.0	<12.0
Barium (mg/kg)	<24.0	35	<24.0	27	<24.0	26	<24.0
Beryllium (mg/kg)	<1.20	<1.20	<1.20	<1.00	<1.20	<1.20	<1.20
Cadmium (mg/kg)	<1.20	<1.20	<1.20	<1.00	<1.20	<1.20	<1.20
Calcium (mg/kg)	2000	3200	5000	1300	950	3800	2200
Chromium (mg/kg)	24	28	21	21	17	26	23
Cobalt (mg/kg)	<6.10	<6.20	<5.90	<5.20	<6.10	<6.10	<6.10
Copper (mg/kg)	<6.10	14	10	10	7.5	9.4	11
Iron (mg/kg)	7430	9380	7760	5470	5120	8220	8690
Lead (mg/kg)	<6.10	<6.20	<5.90	<5.20	<6.10	<6.10	<6.10
Magnesium (mg/kg)	2200	3000	2200	1700	1700	2600	2400
Manganese (mg/kg)	96	120	92	68	71	110	96
Molybdenum (mg/kg)	<6.10	<6.20	<5.90	<5.20	<6.10	<6.10	<6.10
Nickel (mg/kg)	24	30	21	17	18	26	24
Potassium (mg/kg)	<610	840	910	<520	<610	800	920
Silver (mg/kg)	<12.0	<12.0	<12.0	<10.0	<12.0	<12.0	<12.0
Sodium (mg/kg)	<6.10	<6.20	<5.90	<5.20	<6.10	<6.10	<6.10
Thallium (mg/kg)	<610	<620	660	<520	<610	<610	670
Titanium (mg/kg)	390	390	280	270	230	350	280
Vanadium (mg/kg)	18	20	15	12	12	18	17
Zinc (mg/kg)	17	26	20	17	15	22	23

Notes: NA = Not Analyzed
< = Detection Limit
mg/kg = milligrams per kilogram
Data not validated by JMM

TABLE 13-6

SITE 16 - CANS C-2 AREA
RESULTS FOR METALS DETECTED IN SOIL SAMPLES
(Sheet 4 of 15)

Parameter Reported	BC2-8R 07/09/90 1-1.5 ft	BC2-9 07/25/90 0.5-1 ft	BC2-9 07/25/90 5.5-6 ft	BC2-9 07/25/90 9.5-10 ft	BC2-9 07/25/90 14-14.5 ft	MWC2-1 07/25/90 0.5-1 ft	MWC2-1 07/25/90 2.5-3 ft
Aluminum (mg/kg)	3320	3400	3380	4320	6100	4100	3160
Antimony (mg/kg)	<6.20	<6.10	<7.40	<7.40	<7.50	<6.20	<6.20
Arsenic (mg/kg)	<10.0	<10.0	<12.0	<12.0	<12.0	<10.0	<10.0
Barium (mg/kg)	<21.0	39	30	27	38	37	25
Beryllium (mg/kg)	<1.00	<1.00	<1.20	<1.20	<1.20	<1.00	<1.00
Cadmium (mg/kg)	<1.00	<1.00	<1.20	<1.20	<1.20	2.5	<1.00
Calcium (mg/kg)	1700	1900	1400	1800	2800	2100	1500
Chromium (mg/kg)	22	22	20	26	29	29	22
Cobalt (mg/kg)	<5.20	<5.10	<6.20	<6.10	<6.20	<5.10	<5.20
Copper (mg/kg)	9.2	20	11	9.8	18	22	10
Iron (mg/kg)	5610	5860	6020	8170	10300	7210	6250
Lead (mg/kg)	<5.20	<5.10	<6.20	<6.10	<6.20	9	35
Magnesium (mg/kg)	1700	1600	2000	2400	2700	1900	1500
Manganese (mg/kg)	71	76	86	96	85	150	76
Molybdenum (mg/kg)	<5.20	<5.10	<6.20	<6.10	<6.20	<5.10	<5.20
Nickel (mg/kg)	17	16	21	25	30	25	20
Potassium (mg/kg)	<520	<510	<620	780	1100	<510	<520
Silver (mg/kg)	<10.0	<10.0	<12.0	<12.0	<12.0	<10.0	<10.0
Sodium (mg/kg)	<5.20	<5.10	<6.20	<6.10	<6.20	<5.10	<5.20
Thallium (mg/kg)	<520	<510	<620	<610	730	<510	<520
Titanium (mg/kg)	320	300	270	330	320	350	260
Vanadium (mg/kg)	14	13	16	17	20	18	15
Zinc (mg/kg)	16	20	21	22	30	65	17

Notes: NA = Not Analyzed
< = Detection Limit
mg/kg = milligrams per kilogram
Data not validated by JMM

TABLE 13-6

SITE 16 - CANS C-2 AREA
RESULTS FOR METALS DETECTED IN SOIL SAMPLES
(Sheet 5 of 15)

Parameter Reported	MWC2-1 07/25/90 5.5-6 ft	MWC2-1 07/25/90 8.5-9 ft	MWC2-1 07/25/90 11-11.5 ft	MWC2-1 07/25/90 12.5-13 ft	MWC2-1R 07/25/90 1-1.5 ft	MWC2-2 07/24/90 1-1.5 ft	MWC2-2 07/24/90 3-3.5 ft
Aluminum (mg/kg)	3440	4870	14900	7080	4090	5310	4780
Antimony (mg/kg)	<7.30	<7.30	<9.80	<8.00	<6.20	<6.30	<6.30
Arsenic (mg/kg)	<12.0	<12.0	<16.0	<13.0	<10.0	<10.0	<10.0
Barium (mg/kg)	<24.0	36	58	38	44	26	<21.0
Beryllium (mg/kg)	<1.20	<1.20	<1.60	<1.30	<1.00	<1.00	<1.00
Cadmium (mg/kg)	<1.20	<1.20	<1.60	<1.30	<1.00	<1.00	<1.00
Calcium (mg/kg)	1400	1900	3900	2500	2300	3200	2400
Chromium (mg/kg)	18	26	61	38	26	31	28
Cobalt (mg/kg)	<6.10	<6.10	12	<6.70	<5.20	<5.30	<5.20
Copper (mg/kg)	6.5	8.8	36	13	16	18	<5.20
Iron (mg/kg)	5920	8580	26900	12400	8200	8360	7490
Lead (mg/kg)	<6.10	<6.10	14	6.8	<5.20	8.8	<5.20
Magnesium (mg/kg)	2100	2700	7600	3500	2100	2300	2300
Manganese (mg/kg)	81	91	290	140	100	100	100
Molybdenum (mg/kg)	<6.10	<6.10	<8.20	<6.70	<5.20	<5.30	<5.20
Nickel (mg/kg)	21	28	67	35	21	26	24
Potassium (mg/kg)	<610	850	2700	1200	<520	580	<520
Silver (mg/kg)	<12.0	<12.0	<16.0	<6.70	<10.0	<10.0	<10.0
Sodium (mg/kg)	<6.10	<6.10	<8.20	<6.70	<5.20	<5.30	<5.20
Thallium (mg/kg)	<610	<610	2700	<670	<520	<530	<520
Titanium (mg/kg)	260	390	510	370	350	400	400
Vanadium (mg/kg)	13	17	49	24	20	19	20
Zinc (mg/kg)	17	22	71	31	21	27	17

Notes: NA = Not Analyzed
< = Detection Limit
mg/kg = milligrams per kilogram
Data not validated by JMM

TABLE 13-6

SITE 16 - CANS C-2 AREA
RESULTS FOR METALS DETECTED IN SOIL SAMPLES
(Sheet 6 of 15)

Parameter Reported	MWC2-2 07/24/90 6-6.5 ft	MWC2-2 07/24/90 9-9.5 ft	MWC2-2 07/24/90 12-12.5 ft	MWC2-2 07/24/90 14.5-15 ft	MWC2-3 07/25/90 1-1.5 ft	MWC2-3 07/25/90 5-5.5 ft	MWC2-3 07/25/90 7-7.5 ft
Aluminum (mg/kg)	4730	5190	5060	4790	5560	4500	4110
Antimony (mg/kg)	<7.20	<7.80	<7.60	<7.70	<6.40	<7.30	<7.50
Arsenic (mg/kg)	<12.0	<13.0	<13.0	<13.0	<11.0	<12.0	<12.0
Barium (mg/kg)	<24.0	38	26	<26.0	55	25	25
Beryllium (mg/kg)	<1.20	<1.30	<1.30	<1.30	<1.10	<1.20	<1.20
Cadmium (mg/kg)	<1.20	<1.30	<1.30	<1.30	<1.10	<1.20	<1.20
Calcium (mg/kg)	1900	2200	1800	1400	3600	2200	1600
Chromium (mg/kg)	24	27	28	23	14	25	23
Cobalt (mg/kg)	<6.00	<6.50	<6.30	<6.40	<5.30	<6.00	<6.30
Copper (mg/kg)	6.2	21	18	9.7	15	<6.00	<6.30
Iron (mg/kg)	7060	8550	8830	8090	9250	7550	7460
Lead (mg/kg)	<6.00	<6.50	<6.30	<6.40	7.4	<6.00	<6.30
Magnesium (mg/kg)	2100	2800	2600	2200	2600	2400	2500
Manganese (mg/kg)	93	100	100	90	160	93	95
Molybdenum (mg/kg)	<6.00	<6.50	<6.30	<6.40	<5.30	<6.00	<6.30
Nickel (mg/kg)	22	27	26	21	15	24	25
Potassium (mg/kg)	<600	920	800	870	1600	630	770
Silver (mg/kg)	<12.0	<13.0	<13.0	<13.0	<11.0	<12.0	<12.0
Sodium (mg/kg)	<6.00	<6.50	<6.30	<6.40	<5.30	<6.00	<6.30
Thallium (mg/kg)	<600	<650	<630	900	<530	<600	<630
Titanium (mg/kg)	400	400	350	280	430	360	330
Vanadium (mg/kg)	17	18	19	17	16	17	15
Zinc (mg/kg)	17	27	24	22	32	17	19

Notes: NA = Not Analyzed
< = Detection Limit
mg/kg = milligrams per kilogram
Data not validated by JMM

TABLE 13-6

SITE 16 - CANS C-2 AREA
RESULTS FOR METALS DETECTED IN SOIL SAMPLES
(Sheet 7 of 15)

Parameter Reported	MWC2-3 07/25/90 8.5-9 ft	MWC2-3 07/25/90 10-10.5 ft	MWC2-3 07/25/90 12.5-13 ft	SSC2-1 07/24/90 0-0.5 ft	SSC2-10 07/24/90 0-0.5 ft	SSC2-11 07/24/90 0-0.5 ft	SSC2-12 07/24/90 0-0.5 ft
Aluminum (mg/kg)	3890	4160	5400	4840	5360	4260	7210
Antimony (mg/kg)	<7.50	<7.80	<7.60	<6.00	<7.10	<6.00	<6.00
Arsenic (mg/kg)	<12.0	<13.0	<13.0	<10.0	<12.0	<10.0	<10.0
Barium (mg/kg)	<25.0	34	35	66	300	52	61
Beryllium (mg/kg)	<1.20	<1.30	<1.30	<1.00	<1.20	<1.00	<1.00
Cadmium (mg/kg)	<1.20	<1.30	<1.30	12	4.3	9.7	18
Calcium (mg/kg)	1600	1500	2900	3400	6600	2000	4900
Chromium (mg/kg)	21	22	26	87	52	58	130
Cobalt (mg/kg)	<6.20	<6.50	<6.30	5.1	<5.90	<5.00	7.9
Copper (mg/kg)	<6.20	17	14	45	42	26	120
Iron (mg/kg)	7040	7590	9820	12900	14400	13900	25400
Lead (mg/kg)	<6.20	<6.50	<6.30	170	120	180	320
Magnesium (mg/kg)	2300	2500	2900	3300	2900	2300	3100
Manganese (mg/kg)	91	88	110	190	160	150	270
Molybdenum (mg/kg)	<6.20	<6.50	<6.30	<5.00	<5.90	<5.00	<5.00
Nickel (mg/kg)	24	26	30	77	49	56	130
Potassium (mg/kg)	700	830	1100	650	700	690	780
Silver (mg/kg)	<12.0	<13.0	<13.0	<10.0	<12.0	<10.0	19
Sodium (mg/kg)	<6.20	<6.50	<6.30	<5.00	<5.90	<5.00	<5.00
Thallium (mg/kg)	<620	<650	710	<500	<590	<500	<500
Titanium (mg/kg)	300	300	300	300	500	290	380
Vanadium (mg/kg)	15	16	19	17	19	16	30
Zinc (mg/kg)	17	23	25	320	460	618	260

Notes: NA = Not Analyzed
< = Detection Limit
mg/kg = milligrams per kilogram
Data not validated by JMM

TABLE 13-6

SITE 16 - CANS C-2 AREA
RESULTS FOR METALS DETECTED IN SOIL SAMPLES
(Sheet 8 of 15)

Parameter Reported	SSC2-13 07/24/90 0-0.5 ft	SSC2-14 07/24/90 0-0.5 ft	SSC2-15 07/24/90 0-0.5 ft	SSC2-16 07/24/90 0-0.5 ft	SSC2-17 07/24/90 0-0.5 ft	SSC2-18 07/24/90 0-0.5 ft	SSC2-19 07/24/90 0-0.5 ft
Aluminum (mg/kg)	4710	4330	4900	6340	5420	4110	4150
Antimony (mg/kg)	<6.00	<6.00	<6.00	<6.00	<6.00	<6.00	<6.10
Arsenic (mg/kg)	<10.0	<25.0	<25.0	<10.0	<10.0	<10.0	<10.0
Barium (mg/kg)	75	66	59	74	99	43	140
Beryllium (mg/kg)	<1.00	<1.10	<1.00	<1.00	<1.10	<1.00	<1.00
Cadmium (mg/kg)	15	16	34	10	11	6.5	13
Calcium (mg/kg)	1800	2300	2200	3100	3000	2200	2600
Chromium (mg/kg)	150	554	110	47	60	38	75
Cobalt (mg/kg)	6.1	9	10	6.6	6.6	<5.00	5.4
Copper (mg/kg)	75	78	170	53	43	22	57
Iron (mg/kg)	35900	117000	93000	21100	21600	11200	18800
Lead (mg/kg)	420	320	380	180	140	70	200
Magnesium (mg/kg)	2600	2100	2300	2900	2600	2000	2400
Manganese (mg/kg)	230	470	450	330	250	110	180
Molybdenum (mg/kg)	<5.00	12	21	<5.00	<5.00	<5.00	5.4
Nickel (mg/kg)	59	80	150	45	53	32	130
Potassium (mg/kg)	560	630	770	720	620	570	530
Silver (mg/kg)	26	74	64	14	16	<10.0	14
Sodium (mg/kg)	<5.00	<5.00	<5.00	<5.00	<5.00	<5.00	<5.00
Thallium (mg/kg)	<500	<500	<500	<500	<500	<500	<500
Titanium (mg/kg)	200	310	330	390	340	340	280
Vanadium (mg/kg)	16	17	20	25	18	17	14
Zinc (mg/kg)	290	260	320	230	360	95	230

Notes: NA = Not Analyzed
< = Detection Limit
mg/kg = milligrams per kilogram
Data not validated by JMM

TABLE 13-6

SITE 16 - CANS C-2 AREA
RESULTS FOR METALS DETECTED IN SOIL SAMPLES
(Sheet 9 of 15)

Parameter Reported	SSC2-2 07/24/90 0-0.5 ft	SSC2-20 07/24/90 0-0.5 ft	SSC2-21 07/24/90 0-0.5 ft	SSC2-22 07/24/90 0-0.5 ft	SSC2-23 07/24/90 0-0.5 ft	SSC2-24 07/24/90 0-0.5 ft	SSC2-25 07/24/90 0-0.5 ft
Aluminum (mg/kg)	6040	4890	6690	6440	6840	5000	8270
Antimony (mg/kg)	<6.00	<6.00	<6.00	<6.00	<6.00	<6.00	<6.00
Arsenic (mg/kg)	<10.0	<10.0	<10.0	<10.0	<10.0	<10.0	<10.0
Barium (mg/kg)	77	77	61	59	78	66	62
Beryllium (mg/kg)	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00
Cadmium (mg/kg)	22	14	8	14	19	19	18
Calcium (mg/kg)	3500	2700	3400	3100	3500	2500	2300
Chromium (mg/kg)	160	96	78	110	190	99	120
Cobalt (mg/kg)	6.6	6	6.4	9.4	8.5	5.7	9.6
Copper (mg/kg)	92	70	46	120	83	64	519
Iron (mg/kg)	25700	18200	22000	37400	48400	36200	60200
Lead (mg/kg)	180	210	220	230	360	340	330
Magnesium (mg/kg)	4500	2700	3200	2700	3100	2100	2200
Manganese (mg/kg)	230	200	180	260	290	190	310
Molybdenum (mg/kg)	<5.00	6	<5.00	7.1	7.3	5.5	9
Nickel (mg/kg)	130	78	110	83	98	59	90
Potassium (mg/kg)	690	670	760	880	840	620	690
Silver (mg/kg)	<10.0	14	15	28	35	26	43
Sodium (mg/kg)	5.2	<5.00	<5.00	<5.00	8.3	<5.00	<5.00
Thallium (mg/kg)	<500	<500	<500	<500	<500	<500	<500
Titanium (mg/kg)	440	380	420	330	460	300	330
Vanadium (mg/kg)	21	17	24	24	25	22	24
Zinc (mg/kg)	470	300	440	290	240	210	310

Notes: NA = Not Analyzed
< = Detection Limit
mg/kg = milligrams per kilogram
Data not validated by JMM

TABLE 13-6

SITE 16 - CANS C-2 AREA
RESULTS FOR METALS DETECTED IN SOIL SAMPLES
(Sheet 10 of 15)

Parameter Reported	SSC2-26 07/24/90 0-0.5 ft	SSC2-27 07/24/90 0-0.5 ft	SSC2-28 07/24/90 0-0.5 ft	SSC2-29 07/24/90 0-0.5 ft	SSC2-3 07/24/90 0-0.5 ft	SSC2-30 07/24/90 0-0.5 ft	SSC2-31 07/24/90 0-0.5 ft
Aluminum (mg/kg)	9400	6080	4660	4290	6150	5450	7460
Antimony (mg/kg)	<6.00	<6.00	31	<6.00	<6.00	<6.00	<6.00
Arsenic (mg/kg)	<10.0	<10.0	<10.0	<10.0	<10.0	<10.0	<10.0
Barium (mg/kg)	64	64	80	53	100	82	130
Beryllium (mg/kg)	<1.10	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00
Cadmium (mg/kg)	12	9.8	15	12	13	18	15
Calcium (mg/kg)	4700	3700	3700	2100	3200	3000	3600
Chromium (mg/kg)	45	42	63	63	97	77	110
Cobalt (mg/kg)	6.2	6.9	6.1	5	6	6.5	8.3
Copper (mg/kg)	60	63	65	190	59	46	83
Iron (mg/kg)	21000	24500	23200	22200	21700	16400	25000
Lead (mg/kg)	160	130	310	300	230	420	230
Magnesium (mg/kg)	3000	2900	2400	2100	3900	2500	3900
Manganese (mg/kg)	310	330	290	160	220	140	450
Molybdenum (mg/kg)	9.4	<5.00	6.1	<5.00	<5.00	<5.00	6
Nickel (mg/kg)	83	130	80	45	82	64	78
Potassium (mg/kg)	780	590	540	<500	700	720	730
Silver (mg/kg)	16	18	18	14	<10.0	12	17
Sodium (mg/kg)	<5.00	<5.00	<5.00	<5.00	<5.00	<5.00	<5.00
Thallium (mg/kg)	550	<500	<500	<500	<500	<500	<500
Titanium (mg/kg)	450	290	300	330	430	500	400
Vanadium (mg/kg)	27	24	16	17	21	25	24
Zinc (mg/kg)	290	210	320	180	370	240	230

Notes: NA = Not Analyzed
< = Detection Limit
mg/kg = milligrams per kilogram
Data not validated by JMM

TABLE 13-6

SITE 16 - CANS C-2 AREA
RESULTS FOR METALS DETECTED IN SOIL SAMPLES
(Sheet 11 of 15)

Parameter Reported	SSC2-32 07/24/90 0-0.5 ft	SSC2-33 07/24/90 0-0.5 ft	SSC2-34 07/24/90 0-0.5 ft	SSC2-35 07/24/90 0-0.5 ft	SSC2-36 07/24/90 0-0.5 ft	SSC2-37 07/24/90 0-0.5 ft	SSC2-38 07/24/90 0-0.5 ft
Aluminum (mg/kg)	6110	6200	7580	6470	5170	4940	5150
Antimony (mg/kg)	<6.10	<6.30	<6.00	<6.00	<6.00	<6.00	<6.00
Arsenic (mg/kg)	<10.0	<11.0	17	<10.0	<10.0	<10.0	<10.0
Barium (mg/kg)	74	81	66	73	74	45	52
Beryllium (mg/kg)	<1.00	<1.10	<1.10	<1.00	<1.00	<1.00	<1.10
Cadmium (mg/kg)	9.6	8	7.8	12	8.6	12	8.1
Calcium (mg/kg)	2900	2700	3600	3500	3000	2700	3200
Chromium (mg/kg)	71	63	40	43	39	69	64
Cobalt (mg/kg)	8.1	<5.30	6.4	5.7	5.4	5	6.6
Copper (mg/kg)	56	43	190	44	42	30	66
Iron (mg/kg)	73600	16800	25400	21000	19900	15100	27100
Lead (mg/kg)	280	240	220	160	180	380	220
Magnesium (mg/kg)	2700	2800	3400	2900	2800	2300	3100
Manganese (mg/kg)	420	220	410	260	260	120	200
Molybdenum (mg/kg)	5.9	<5.30	<5.00	<5.00	<5.00	<5.00	7.2
Nickel (mg/kg)	67	55	33	51	53	50	56
Potassium (mg/kg)	820	610	740	670	580	630	530
Silver (mg/kg)	29	<11.0	12	<10.0	<10.0	<10.0	12
Sodium (mg/kg)	<5.00	<5.30	<5.00	<5.00	<5.00	<5.00	<5.00
Thallium (mg/kg)	<500	<530	<500	<500	<500	<500	<500
Titanium (mg/kg)	360	320	250	410	270	440	260
Vanadium (mg/kg)	22	17	29	22	20	19	19
Zinc (mg/kg)	150	160	250	160	150	170	190

Notes: NA = Not Analyzed
< = Detection Limit
mg/kg = milligrams per kilogram
Data not validated by JMM

TABLE 13-6

SITE 16 - CANS C-2 AREA
RESULTS FOR METALS DETECTED IN SOIL SAMPLES
(Sheet 12 of 15)

Parameter Reported	SSC2-39 07/24/90 0-0.5 ft	SSC2-4 07/24/90 0-0.5 ft	SSC2-40 07/24/90 0-0.5 ft	SSC2-41 07/26/90 0-0.5 ft	SSC2-42 07/26/90 0-0.5 ft	SSC2-43 07/26/90 0-0.5 ft	SSC2-44 07/26/90 0-0.5 ft
Aluminum (mg/kg)	6620	4680	7080	12700	13500	8820	7930
Antimony (mg/kg)	<6.00	<6.10	<6.00	5.6	6.8	2.9	4.5
Arsenic (mg/kg)	<10.0	<10.0	<10.0	6.1	6.7	5.7	13.2
Barium (mg/kg)	68	110	63	149	163	96.1	80.3
Beryllium (mg/kg)	<1.00	<1.00	<1.00	0.6	0.6	0.3	<0.200
Cadmium (mg/kg)	21	5.6	16	0.7	0.7	1	4
Calcium (mg/kg)	3600	4500	6500	14600	13900	5940	4530
Chromium (mg/kg)	85	76	62	24.9	25.4	30.6	40.5
Cobalt (mg/kg)	8.8	5	8.2	11.7	11.7	7.7	6.3
Copper (mg/kg)	68	38	66	32.7	43.9	24	43.4
Iron (mg/kg)	29300	12000	29600	23600	23800	16500	24900
Lead (mg/kg)	500	130	310	13.4	16.4	22.6	137
Magnesium (mg/kg)	3800	3800	3900	7420	7600	5180	3980
Manganese (mg/kg)	220	150	230	417	480	357	424
Molybdenum (mg/kg)	6.7	<5.00	6.5	<1.00	1.1	<1.00	3.2
Nickel (mg/kg)	96	76	79	38.2	37.2	39.6	49.4
Potassium (mg/kg)	650	640	650	2320	2400	1300	970
Silver (mg/kg)	12	<10.0	13	<4.40	<4.40	<4.40	<4.30
Sodium (mg/kg)	<5.00	<5.00	<5.00	<0.600	<0.600	<0.600	1
Thallium (mg/kg)	<500	<500	<500	274	280	253	414
Titanium (mg/kg)	360	310	440	1110	1372	708	348
Vanadium (mg/kg)	24	16	25	26.2	28.8	31.9	29.1
Zinc (mg/kg)	320	817	300	79.3	83.1	174.9	131

Notes: NA = Not Analyzed
< = Detection Limit
mg/kg = milligrams per kilogram
Data not validated by JMM

TABLE 13-6

SITE 16 - CANS C-2 AREA
RESULTS FOR METALS DETECTED IN SOIL SAMPLES
(Sheet 13 of 15)

Parameter Reported	SSC2-45 07/24/90 0-0.5 ft	SSC2-46 07/24/90 0-0.5 ft	SSC2-47 07/26/90 0-0.5 ft	SSC2-48 07/26/90 0-0.5 ft	SSC2-49 07/26/90 0-0.5 ft	SSC2-5 07/24/90 0-0.5 ft	SSC2-50 07/26/90 0-0.5 ft
Aluminum (mg/kg)	7990	4510	15000	11800	14000	4460	17300
Antimony (mg/kg)	5.8	<2.10	6.7	5.3	7.3	<6.00	6.6
Arsenic (mg/kg)	14	<2.50	7.8	8.3	6.7	<10.0	11.1
Barium (mg/kg)	81.6	94.4	286	145	196	84	241
Beryllium (mg/kg)	0.2	<0.200	0.5	0.5	0.5	<1.00	0.7
Cadmium (mg/kg)	4.5	1.3	0.7	0.6	0.8	4.6	0.8
Calcium (mg/kg)	7080	3900	14600	13200	16000	5100	19900
Chromium (mg/kg)	27.8	26.8	27	20.9	24.2	48	30
Cobalt (mg/kg)	7.8	5	15	11.4	14.2	<5.00	15.4
Copper (mg/kg)	33.3	18.5	69.6	34.8	49.3	35	69
Iron (mg/kg)	34300	9430	28400	23900	26200	9890	30300
Lead (mg/kg)	144	28.5	13.9	12.3	16.7	92	18.2
Magnesium (mg/kg)	4260	2740	9460	7360	8610	2900	9770
Manganese (mg/kg)	573	145	515	396	473	140	544
Molybdenum (mg/kg)	1.8	<1.00	<1.10	1.1	<1.00	<5.00	<1.10
Nickel (mg/kg)	26	25.1	46.1	35.9	41.2	44	46.9
Potassium (mg/kg)	1100	830	2010	2000	1800	560	2600
Silver (mg/kg)	<4.30	<4.40	<4.40	<4.40	<4.40	<10.0	<4.40
Sodium (mg/kg)	1.3	<0.600	<0.600	<0.600	<0.600	<5.00	<0.600
Thallium (mg/kg)	454	181	388	235	478	<500	427
Titanium (mg/kg)	418	289	997	830	893	320	1780
Vanadium (mg/kg)	32.7	14.6	34.8	23.4	29.6	15	37.3
Zinc (mg/kg)	132	50.9	91.6	76.6	79.1	666	89.9

Notes: NA = Not Analyzed
< = Detection Limit
mg/kg = milligrams per kilogram
Data not validated by JMM

TABLE 13-6

SITE 16 - CANS C-2 AREA
RESULTS FOR METALS DETECTED IN SOIL SAMPLES
(Sheet 14 of 15)

Parameter Reported	SSC2-51 07/26/90 0-0.5 ft	SSC2-52 07/26/90 0-0.5 ft	SSC2-53 07/26/90 0-0.5 ft	SSC2-54 07/26/90 0-0.5 ft	SSC2-55 07/26/90 0-0.5 ft	SSC2-6 07/24/90 0-0.5 ft	SSC2-7 07/24/90 0-0.5 ft
Aluminum (mg/kg)	12800	15400	13300	14600	14600	6230	5060
Antimony (mg/kg)	4	6.9	5.9	5.7	6.8	<6.00	<6.00
Arsenic (mg/kg)	6.2	8.2	8.7	7.6	7.6	45	<10.0
Barium (mg/kg)	138	271	242	316	228	71	98
Beryllium (mg/kg)	0.5	0.6	0.5	0.7	0.7	<1.00	<1.00
Cadmium (mg/kg)	0.6	0.7	0.6	0.8	0.7	4.4	7.9
Calcium (mg/kg)	15000	18300	16400	18600	17200	5600	3400
Chromium (mg/kg)	24.5	28.7	23.5	24.2	28.5	50	47
Cobalt (mg/kg)	9.7	14.9	13.5	14	15	5.2	6.2
Copper (mg/kg)	33.8	65	40.2	39	95.9	110	1390
Iron (mg/kg)	22100	27500	25300	27000	27800	12400	13100
Lead (mg/kg)	14.7	18.1	11.3	12.1	17.4	110	120
Magnesium (mg/kg)	7480	9170	7940	8200	8790	3500	2800
Manganese (mg/kg)	409	583	480	504	507	160	200
Molybdenum (mg/kg)	<1.00	<1.10	<1.00	<1.10	<1.10	<5.00	<5.00
Nickel (mg/kg)	36.1	44.8	38.9	39.3	42.3	59	798
Potassium (mg/kg)	2100	2240	2300	2300	2300	750	740
Silver (mg/kg)	<4.30	<4.40	<4.40	<4.50	<4.50	<10.0	<10.0
Sodium (mg/kg)	<0.600	<0.600	<0.600	<0.600	0.6	<5.00	<5.00
Thallium (mg/kg)	307	330	291	297	269	<500	<500
Titanium (mg/kg)	1300	1460	1100	1450	1360	420	350
Vanadium (mg/kg)	28.1	35.4	27.6	29.8	29.2	20	17
Zinc (mg/kg)	69.9	86.9	79	89.8	122	568	430

Notes: NA = Not Analyzed
< = Detection Limit
mg/kg = milligrams per kilogram
Data not validated by JMM

TABLE 13-6

SITE 16 - CANS C-2 AREA
RESULTS FOR METALS DETECTED IN SOIL SAMPLES
(Sheet 15 of 15)

Parameter Reported	SSC2-8 07/24/90 0-0.5 ft	SSC2-9 07/24/90 0-0.5 ft
Aluminum (mg/kg)	6550	4820
Antimony (mg/kg)	<6.00	<6.00
Arsenic (mg/kg)	<10.0	<10.0
Barium (mg/kg)	110	74
Beryllium (mg/kg)	<1.00	<1.00
Cadmium (mg/kg)	4.2	6.2
Calcium (mg/kg)	9500	5700
Chromium (mg/kg)	55	43
Cobalt (mg/kg)	5.4	<5.00
Copper (mg/kg)	62	41
Iron (mg/kg)	14100	12000
Lead (mg/kg)	100	83
Magnesium (mg/kg)	3700	2800
Manganese (mg/kg)	180	140
Molybdenum (mg/kg)	<5.00	5.4
Nickel (mg/kg)	53	48
Potassium (mg/kg)	690	640
Silver (mg/kg)	<10.0	<10.0
Sodium (mg/kg)	<5.00	<5.00
Thallium (mg/kg)	<500	<500
Titanium (mg/kg)	400	350
Vanadium (mg/kg)	20	16
Zinc (mg/kg)	1020	554

Notes: NA = Not Analyzed
< = Detection Limit
mg/kg = milligrams per kilogram
Data not validated by JMM

TABLE 13-7

SITE 16 - CANS C-2 AREA
RESULTS FOR TOTAL ORGANIC CARBON, pH, AND CATIONS/ANIONS DETECTED IN SOIL SAMPLES
(Sheet 1 of 2)

Parameter Reported	BC2-4 07/24/90 3.5-4 ft	BC2-4 07/24/90 4-4.5 ft	BC2-4 07/24/90 5-5.5 ft	BC2-5 07/24/90 2.5-3 ft	BC2-6 07/25/90 3.5-4 ft	BC2-7 07/24/90 2.5-3 ft	BC2-7 07/24/90 3.5-4 ft
Characteristic Measurements							
pH (Units)	8.6	7.3	8.5	8	7.8	8.5	8.5

	BC2-4 07/24/90 3.5-4 ft	BC2-5 07/24/90 4-4.5 ft	BC2-6 07/25/90 4-4.5 ft	BC2-7 07/24/90 4-4.5 ft	BC2-8 07/25/90 4-4.5 ft	BC2-9 07/25/90 4-4.5 ft	MWC2-1 07/25/90 0.5-1 ft
Cations/Anions							
Cation Exchange Capacity (meq/hg)	2	3.36	3.6	3.12	2.96	6.96	3.2

	BC2-4 07/24/90 3.5-4 ft	BC2-4 07/24/90 4-4.5 ft	BC2-5 07/24/90 4-4.5 ft	BC2-6 07/25/90 4-4.5 ft	BC2-7 07/24/90 4-4.5 ft	BC2-8 07/25/90 4-4.5 ft	BC2-9 07/25/90 4-4.5 ft
Total Organic Carbon							
Total Organic Carbon (mg/kg)	328	164	328	218	273	273	382

Notes: NA = Not Analyzed
< = Detection Limit
mg/kg = milligrams per kilogram
Data not validated by JMM

TABLE 13-7

SITE 16 - CANS C-2 AREA
RESULTS FOR TOTAL ORGANIC CARBON, pH, AND CATIONS/ANIONS IN SOIL SAMPLES
(Sheet 2 of 2)

Parameter Reported	BC2-8 07/25/90 3.5-4 ft	BC2-9 07/25/90 3.5-4 ft	MWC2-1 07/25/90 2.5-3 ft	MWC2-2 07/24/90 3-3.5 ft	MWC2-3 07/25/90 5-5.5 ft
Characteristic Measurements					
pH (Units)	7.1	8.6	8.1	8.3	9.2

	MWC2-1 07/25/90 4-4.5 ft	MWC2-2 07/24/90 4-4.5 ft	MWC2-3 07/25/90 1-1.5 ft	MWC2-3 07/25/90 3.5-4 ft
Cations/Anions				
Cation Exchange Capacity (meq/hg)	3.28	2.88	5.04	2.32

	MWC2-1 07/25/90 4-4.5 ft	MWC2-2 07/24/90 4-4.5 ft	MWC2-3 07/25/90 3.5-4 ft
Total Organic Carbon			
Total Organic Carbon (mg/kg)	218	273	273

Notes: NA = Not Analyzed
< = Detection Limit
mg/kg = milligrams per kilogram
Data not validated by JMM

TABLE 13-8

SITE 16 - CANS C-2 AREA
RESULTS FOR GENERAL CHEMICAL CHARACTERISTICS IN SOIL SAMPLES
(Sheet 1 of 2)

Parameter Reported	BC2-4 07/24/90 3.5-4 ft	BC2-5 07/24/90 4-4.5 ft	BC2-6 07/25/90 4-4.5 ft	BC2-7 07/24/90 4-4.5 ft	BC2-8 07/25/90 4-4.5 ft	BC2-9 07/25/90 4-4.5 ft	MWC2-1 07/25/90 4-4.5 ft
Ash (%)	99.3	99.3	99.2	99.4	99.3	NA	99.3
Chloride (mg/kg)	5.2	5.5	6.2	5.7	8.2	6.7	9.9
Nitrate (as Nitrogen) (mg/kg)	0.39	<0.110	0.23	0.2	0.24	<0.120	<0.120
Sulfate (mg/kg)	2.4	15.7	26	6.7	8.5	16.4	3.5
Total Kjeldahl Nitrogen (mg/kg)	84	67.2	84	67.2	67.2	101	67.2
Total Phosphorus (mg/kg)	453	497	312	648	648	382	285
Total Cyanide (mg/kg)	NA	NA	NA	NA	NA	NA	NA

Parameter Reported	MWC2-2 07/24/90 4-4.5 ft	MWC2-3 07/25/90 3.5-4 ft	SSC2-11 07/24/90 0-0.5 ft	SSC2-12 07/24/90 0-0.5 ft	SSC2-13 07/24/90 0-0.5 ft	SSC2-14 07/24/90 0-0.5 ft	SSC2-2 07/24/90 0-0.5 ft
Ash (%)	99.2	99.3	NA	NA	NA	NA	NA
Chloride (mg/kg)	6.1	6.6	NA	NA	NA	NA	NA
Nitrate (as Nitrogen) (mg/kg)	<0.100	<0.120	NA	NA	NA	NA	NA
Sulfate (mg/kg)	5.9	7.5	NA	NA	NA	NA	NA
Total Kjeldahl Nitrogen (mg/kg)	61.6	72.8	NA	NA	NA	NA	NA
Total Phosphorus (mg/kg)	338	409	NA	NA	NA	NA	NA
Total Cyanide (mg/kg)	NA	NA	1.1	1.8	1	1.5	5.4

Notes: NA = Not Analyzed
< = Detection Limit
mg/kg = milligrams per kilogram
Data not validated by JMM

TABLE 13-8

SITE 16 - CANS C-2 AREA
RESULTS FOR GENERAL CHEMICAL CHARACTERISTICS IN SOIL SAMPLES
(Sheet 2 of 2)

Parameter Reported	SSC2-20 07/24/90 0-0.5 ft	SSC2-21 07/24/90 0-0.5 ft	SSC2-22 07/24/90 0-0.5 ft	SSC2-23 07/24/90 0-0.5 ft	SSC2-24 07/24/90 0-0.5 ft	SSC2-25 07/24/90 0-0.5 ft	SSC2-26 07/24/90 0-0.5 ft
Ash (%)	NA	NA	NA	NA	NA	NA	NA
Chloride (mg/kg)	NA	NA	NA	NA	NA	NA	NA
Nitrate (as Nitrogen) (mg/kg)	NA	NA	NA	NA	NA	NA	NA
Sulfate (mg/kg)	NA	NA	NA	NA	NA	NA	NA
Total Kjeldahl Nitrogen (mg/kg)	NA	NA	NA	NA	NA	NA	NA
Total Phosphorus (mg/kg)	NA	NA	NA	NA	NA	NA	NA
Total Cyanide (mg/kg)	1.2	1.2	1.7	7.8	1.1	1.8	1.1

Parameter Reported	SSC2-31 07/24/90 0-0.5 ft	SSC2-33 07/24/90 0-0.5 ft	SSC2-34 07/24/90 0-0.5 ft	SSC2-38 07/24/90 0-0.5 ft	SSC2-39 07/24/90 0-0.5 ft	SSC2-8 07/24/90 0-0.5 ft
Ash (%)	NA	NA	NA	NA	NA	NA
Chloride (mg/kg)	NA	NA	NA	NA	NA	NA
Nitrate (as Nitrogen) (mg/kg)	NA	NA	NA	NA	NA	NA
Sulfate (mg/kg)	NA	NA	NA	NA	NA	NA
Total Kjeldahl Nitrogen (mg/kg)	NA	NA	NA	NA	NA	NA
Total Phosphorus (mg/kg)	NA	NA	NA	NA	NA	NA
Total Cyanide (mg/kg)	1.4	1.1	1.1	1.6	1.4	2.1

Notes: NA = Not Analyzed
< = Detection Limit
mg/kg = milligrams per kilogram
Data not validated by JMM

TABLE 13- 9

SITE 16 - CANS C-2 AREA
RESULTS FOR VOLATILE ORGANIC COMPOUNDS AND TOTAL ORGANIC CARBON
DETECTED IN GROUNDWATER SAMPLES

Parameter Reported	MWC2-1 08/29/90 0-0 ft	MWC2-2 10/18/90 0-0 ft	MWC2-3 08/30/90 0-0 ft
Total Organic Carbon			
Total Organic Carbon (mg/L)	10.3	9.7	10.7
Volatile Organic Compounds			
Methylene Chloride (ug/L)	6	7	
Trichloroethene (ug/L)	<5.00	7	

Notes: NA = Not Analyzed
< = Detection Limit
mg/L = milligrams per liter
ug/L = micrograms per liter
Data not validated by JMM

TABLE 13-10

SITE 16 - CANS C-2 AREA
RESULTS FOR METALS DETECTED IN GROUNDWATER SAMPLES

Parameter Reported	MWC2-1 08/29/90 0-0 ft	MWC2-2 10/18/90 0-0 ft	MWC2-3 08/30/90 0-0 ft
Arsenic (mg/L)	78	64	86
Barium (mg/L)	0.41	0.31	0.49
Calcium (mg/L)	30	61	40
Chromium (mg/L)	0.27	0.2	0.34
Cobalt (mg/L)	0.05	<0.050	0.057
Copper (mg/L)	0.14	0.095	0.12
Iron (mg/L)	116	90	136
Lead (mg/L)	<0.100	<0.100	0.05
Magnesium (mg/L)	33	41	39
Manganese (mg/L)	1.1	0.95	1.2
Nickel (mg/L)	0.31	0.23	0.36
Potassium (mg/L)	20	28	21
Selenium (mg/L)	<0.050	<0.050	0.1
Sodium (mg/L)	129	56	28
Titanium (mg/L)	2.4	1.9	3
Vanadium (mg/L)	0.22	0.16	0.25
Zinc (mg/L)	0.31	0.23	0.28

Notes: NA = Not Analyzed
< = Detection Limit
mg/L = milligrams per liter
Data not validated by JMM

TABLE 13-11

SITE 16 CANS C-2 AREA
RESULTS FOR DISSOLVED OXYGEN, pH, AND SPECIFIC CONDUCTANCE DETECTED IN GROUNDWATER SAMPLES

Parameter Reported	MWC2-1 08/29/90 0-0 ft	MWC2-2 10/18/90 0-0 ft	MWC2-3 08/30/90 0-0 ft
Characteristic Measurements			
Dissolved Oxygen (mg/L)	3	4	2.6
pH (Units)	8.4	7.8	8.4
Specific Conductance (umhos/cm)	810	700	290

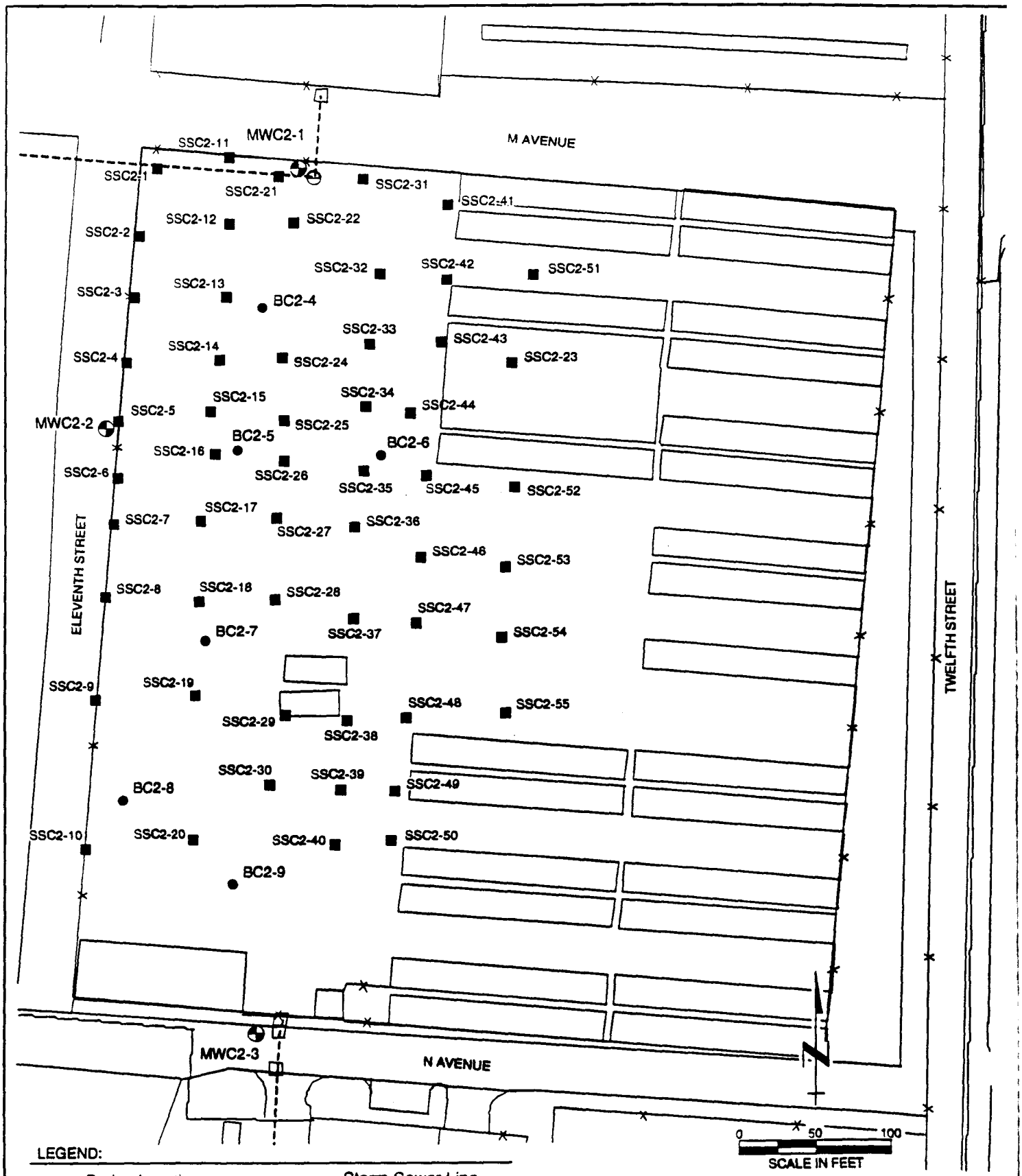
Notes: NA = Not Analyzed
< = Detection Limit
mg/L = milligrams per liter
umhos/cm = micromhos per centimeter
Data not validated by JMM

TABLE 13-12

SITE 16 - CANS C-2 AREA
RESULTS FOR GENERAL CHEMICAL CHARACTERISTICS IN GROUNDWATER SAMPLES

Parameter Reported	MWC2-1 08/29/90 0-0 ft	MWC2-2 10/18/90 0-0 ft	MWC2-3 08/30/90 0-0 ft
Alkalinity, bicarb (as CaCO3) (mg/L)	220	240	110
Alkalinity, carb (as CaCO3) (mg/L)	20	<5.00	<5.00
Alkalinity, total (as CaCO3) (mg/L)	240	240	110
Chloride (mg/L)	47	28	9.1
Sulfate (mg/L)	39	54	20
Total Dissolved Solids (mg/L)	780	460	350
Total Hardness (as CaCO3) (mg/L)	211	321	260
Total Cyanide (mg/L)	<0.010	0.19	<0.010

Notes: NA = Not Analyzed
< = Detection Limit
mg/L = milligrams per liter
Data not validated by JMM



LEGEND:

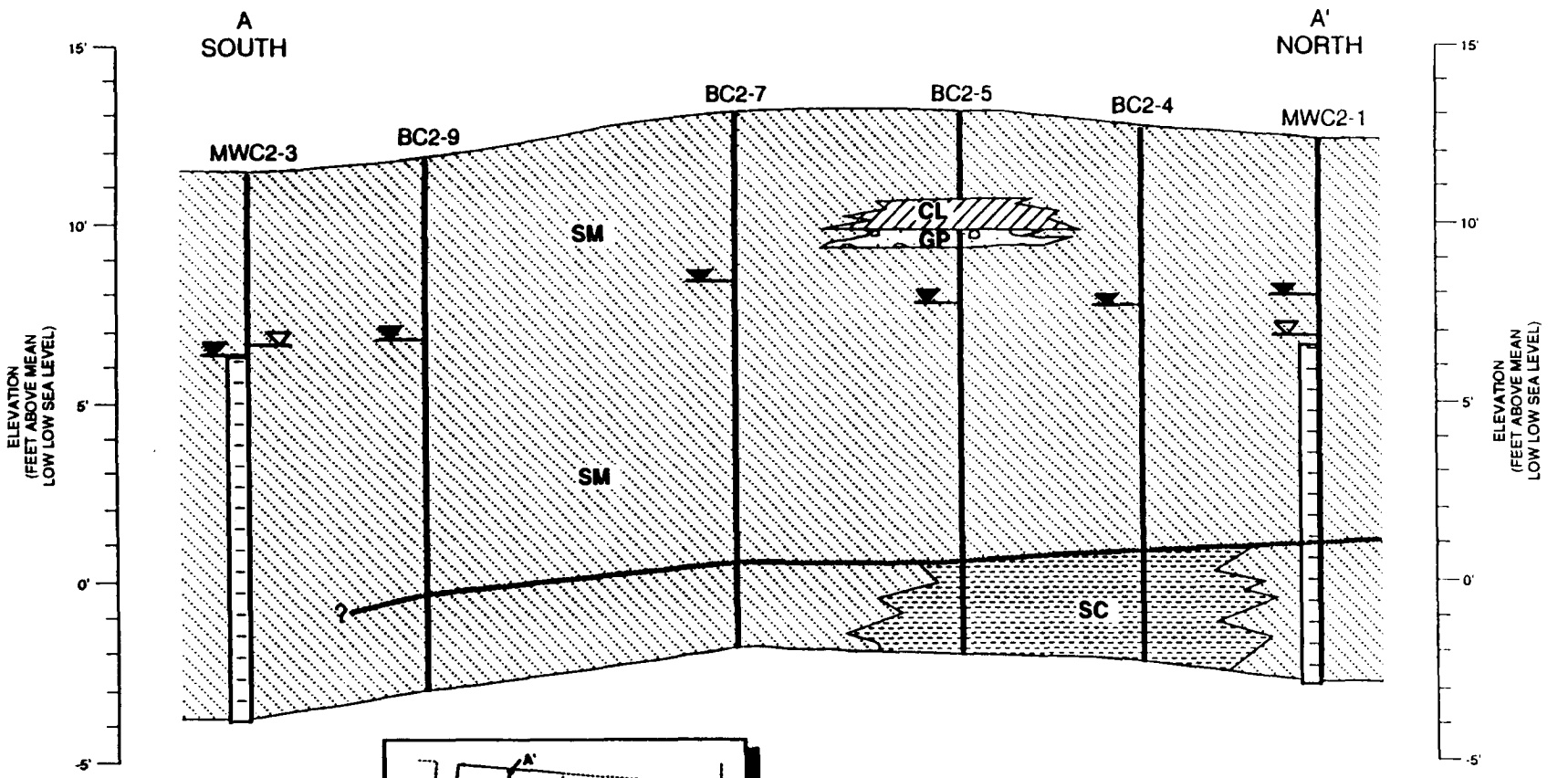
- Boring Location
- Surface Sample Location
- Monitoring Well Location
- Fence
- Storm Sewer Line
- Railroad
- Manhole
- Catch Basin

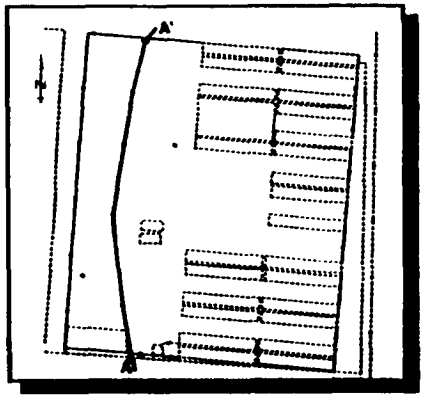
NOTE:
Boring and monitoring well locations were obtained from a base map provided by Canonie Environmental, Inc. The individual locations were digitized onto a base map CAD file provided by NAS Alameda.

A-22

NAVAL AIR STATION ALAMEDA
ALAMEDA, CALIFORNIA
SITE 16 - CANS C2 AREA
CANONIE BORING, SURFACE SAMPLE AND MONITORING WELL LOCATIONS

FIGURE 13-1

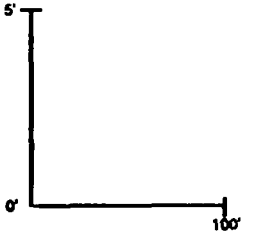




This cross section is based on logs of wells and borings drilled and logged by Canonie Environmental, Inc. All water levels were measured by Canonie Environmental, Inc.

LEGEND:

- GP Gravelly Sand
- SP Sand
- SM Silty Sand
- SC Clayey Sand
- CL Clay
- AS Asphalt
- Approximate Fill/Native Sediment Interface
- Water Level During Water Sampling
- First Water During Drilling
- Monitoring Well
- Screened Interval



Scale in Feet
Vertical Exaggeration 20:1

NAVAL AIR STATION ALAMEDA
ALAMEDA, CALIFORNIA
SITE 16 - CANS C2 AREA
GEOLOGIC CROSS SECTION A-A'

FIGURE 13-2

BC2-4

(ug/kg) Depth (ft)	2-2.5 ft	5.5-6 ft	8.5-9 ft	11.5-12 ft	14-14.5 ft
Methylene Chloride	8	11	9	6	6
Acetone	12	38	36	18	50
Carbon Disulfide	<5.00	<6.00	<6.00	<6.00	2
1,1-Dichloroethane	<5.00	<6.00	<6.00	<6.00	<7.00
1,2-Dichloroethene (total)	<5.00	<6.00	<6.00	<6.00	<7.00
2-Butanone	<10.0	<12.0	5	<13.0	7
Toluene	8	6	9	20	3
1,4-Dichlorobenzene	<5.00	3	<6.00	<6.00	<7.00
1,2-Dichlorobenzene	<5.00	11	3	<6.00	<7.00

MWC2-1

(ug/kg) Depth (ft)	2-2.5 ft	5-5.5 ft	8-8.5 ft	10.5-11 ft	11.5-12 ft
Methylene Chloride	8	17	15	9	16
Acetone	<10.0	<12.0	<13.0	23	48
Carbon Disulfide	<5.00	<6.00	<6.00	<7.00	17
1,1-Dichloroethane	<5.00	<6.00	<6.00	<7.00	<7.00
1,2-Dichloroethene (total)	<5.00	<6.00	<6.00	<7.00	<7.00
2-Butanone	<10.0	<12.0	<13.0	<14.0	<14.0
Toluene	6	<6.00	<6.00	<7.00	60
1,4-Dichlorobenzene	NA	NA	NA	NA	NA
1,2-Dichlorobenzene	NA	NA	NA	NA	NA

BC2-5

(ug/kg) Depth (ft)	2.5-3 ft	5.5-6 ft	8.5-9 ft	11.5-12 ft	14.5-15 ft
Methylene Chloride	7	6	8	6	7
Acetone	50	23	25	80	14
Carbon Disulfide	<5.00	<6.00	<6.00	<6.00	1
1,1-Dichloroethane	<5.00	<6.00	<6.00	<6.00	<6.00
1,2-Dichloroethene (total)	<5.00	<6.00	<6.00	<6.00	<6.00
2-Butanone	3	<12.0	3	<12.0	3
Toluene	21	6	<6.00	2	4
1,4-Dichlorobenzene	<5.00	<6.00	<6.00	<6.00	<6.00
1,2-Dichlorobenzene	<5.00	<6.00	<6.00	<6.00	<6.00

MWC2-2

(ug/kg) Depth (ft)	2.5-3 ft	5.5-6 ft	8.5-9 ft	11.5-12 ft	14-14.5 ft
Methylene Chloride	11	23	22	11	11
Acetone	39	20	31	60	17
Carbon Disulfide	<5.00	<6.00	<6.00	<6.00	<6.00
1,1-Dichloroethane	<5.00	<6.00	<6.00	<6.00	<6.00
1,2-Dichloroethene (total)	<5.00	<6.00	<6.00	<6.00	<6.00
2-Butanone	<10.0	<12.0	<13.0	<12.0	6
Toluene	<5.00	<6.00	<6.00	2	3
1,4-Dichlorobenzene	<5.00	<6.00	<6.00	<6.00	<6.00
1,2-Dichlorobenzene	<5.00	<6.00	<6.00	<6.00	<6.00

BC2-6

(ug/kg) Depth (ft)	3.5-4 ft	7-7.5 ft	11-11.5 ft	13-13.5 ft
Methylene Chloride	12	12	10	<6.00
Acetone	14	21	<12.0	13
Carbon Disulfide	<6.00	<6.00	<6.00	<6.00
1,1-Dichloroethane	<6.00	<6.00	<6.00	<6.00
1,2-Dichloroethene (total)	<6.00	<6.00	<6.00	<6.00
2-Butanone	<12.0	<12.0	<12.0	<12.0
Toluene	200	41	20	17
1,4-Dichlorobenzene	NA	NA	NA	NA
1,2-Dichlorobenzene	NA	NA	NA	NA

BC2-8

(ug/kg) Depth (ft)	3.5-4 ft	7-7.5 ft	11-11.5 ft	14-14.5 ft
Methylene Chloride	<5.00	<6.00	7	6
Acetone	<10.0	<13.0	17	16
Carbon Disulfide	<5.00	<6.00	<6.00	<6.00
1,1-Dichloroethane	<5.00	<6.00	<6.00	<6.00
1,2-Dichloroethene (total)	<5.00	<6.00	17	<6.00
2-Butanone	<10.0	<13.0	<12.0	<13.0
Toluene	10	11	65	36
1,4-Dichlorobenzene	NA	NA	NA	NA
1,2-Dichlorobenzene	NA	NA	NA	NA

BC2-7

(ug/kg) Depth (ft)	2.5-3 ft	7-7.5 ft	11-11.5 ft	13.5-14 ft
Methylene Chloride	8	10	15	9
Acetone	32	45	17	110
Carbon Disulfide	<5.00	<6.00	<6.00	2
1,1-Dichloroethane	<5.00	5	<6.00	<6.00
1,2-Dichloroethene (total)	<5.00	4	<6.00	4
2-Butanone	<11.0	<12.0	<12.0	5
Toluene	<5.00	4	8	5
1,4-Dichlorobenzene	<5.00	<6.00	<6.00	<6.00
1,2-Dichlorobenzene	<5.00	<6.00	<6.00	<6.00

MWC2-3

(ug/kg) Depth (ft)	4-4.5 ft	6.5-7 ft	8-8.5 ft	9.5-10 ft	11-11.5 ft
Methylene Chloride	13	7	9	12	8
Acetone	28	<12.0	<13.0	93	16
Carbon Disulfide	<6.00	<6.00	<7.00	<6.00	<6.00
1,1-Dichloroethane	<6.00	<6.00	<7.00	<6.00	<6.00
1,2-Dichloroethene (total)	<6.00	<6.00	<7.00	<6.00	<6.00
2-Butanone	<12.0	<12.0	<13.0	<12.0	<12.0
Toluene	<6.00	<6.00	<7.00	47	10
1,4-Dichlorobenzene	NA	NA	NA	NA	NA
1,2-Dichlorobenzene	NA	NA	NA	NA	NA

BC2-9

(ug/kg) Depth (ft)	3.5-4 ft	7-7.5 ft	11-11.5 ft	13-13.5 ft
Methylene Chloride	7	9	10	10
Acetone	<11.0	<13.0	21	17
Carbon Disulfide	<6.00	<6.00	<6.00	7
1,1-Dichloroethane	<6.00	<6.00	<6.00	<6.00
1,2-Dichloroethene (total)	<6.00	<6.00	<6.00	<6.00
2-Butanone	<11.0	<13.0	<12.0	<12.0
Toluene	7	18	32	32
1,4-Dichlorobenzene	NA	NA	NA	NA
1,2-Dichlorobenzene	NA	NA	NA	NA

MWC2-1
BC2-4
MWC2-2
BC2-5
BC2-6
BC2-7
BC2-8
BC2-9
MWC2-3
ELEVENTH STREET
N AVENUE
TWELFTH STREET

0 50 100
SCALE IN FEET

LEGEND:

- Canonie Boring Location
- Canolnie Monitoring Well Location
- Fence
- Storm Sewer Line
- Manhole
- Catch Basin

NOTES:
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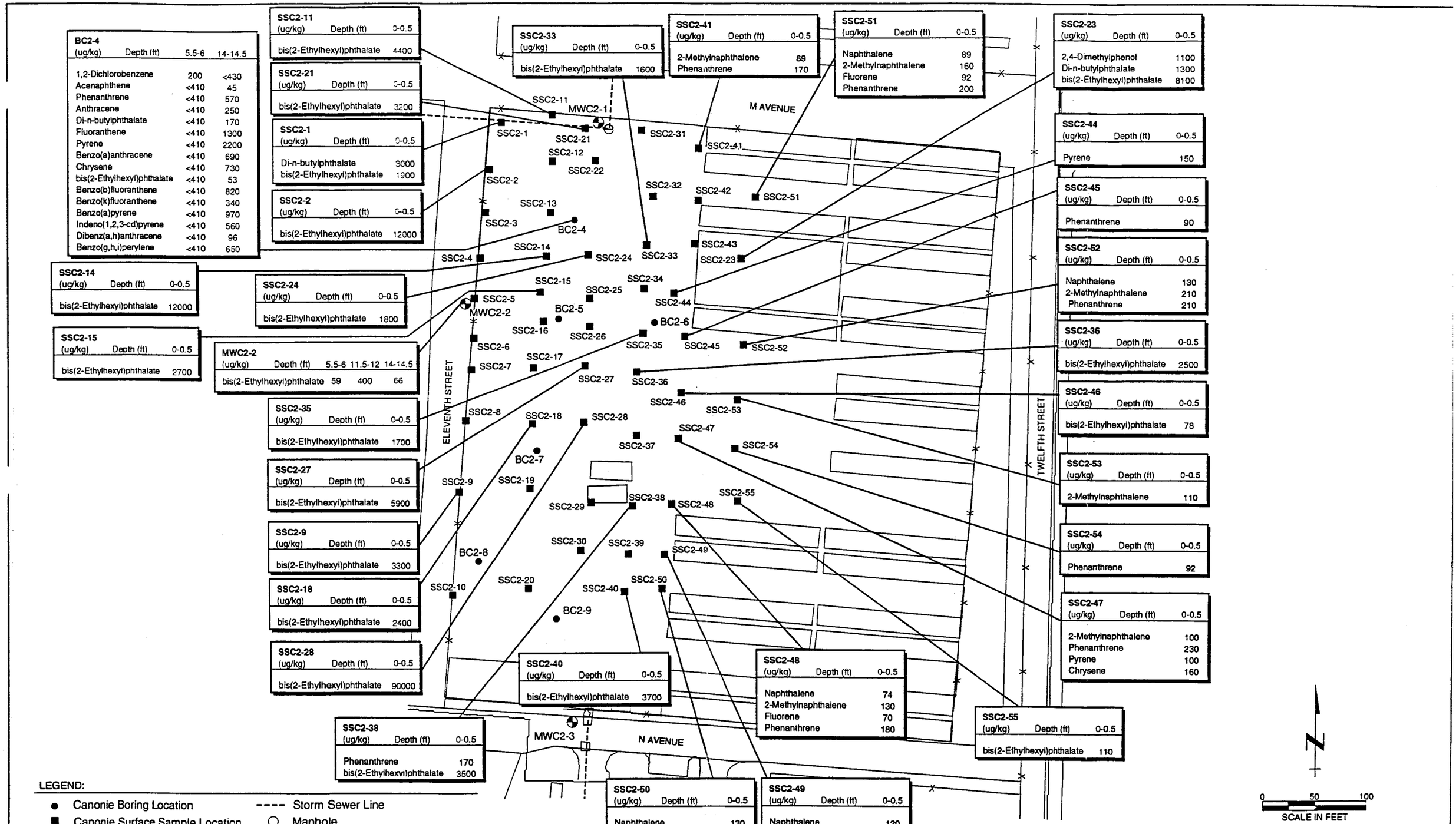
P1&2A.A-24

NAVAL AIR STATION ALAMEDA
ALAMEDA, CALIFORNIA
SITE 16 - CANS C2 AREA
VOLATILE ORGANIC COMPOUNDS IN SOIL

FIGURE 13-3


BC2-4
(ug/kg) Depth (ft) 5.5-6 14-14.5
1,2-Dichlorobenzene 200 <430
Acenaphthene <410 45
Phenanthrene <410 570
Anthracene <410 250
Di-n-butylphthalate <410 170
Fluoranthene <410 1300
Pyrene <410 2200
Benzo(a)anthracene <410 690
Chrysene <410 730
bis(2-Ethylhexyl)phthalate <410 53
Benzo(b)fluoranthene <410 820
Benzo(k)fluoranthene <410 340
Benzo(a)pyrene <410 970
Indeno(1,2,3-cd)pyrene <410 560
Dibenz(a,h)anthracene <410 96
Benzo(g,h,i)perylene <410 650
SSC2-11
(ug/kg) Depth (ft) 0-0.5
bis(2-Ethylhexyl)phthalate 4400
SSC2-21
(ug/kg) Depth (ft) 0-0.5
bis(2-Ethylhexyl)phthalate 3200
SSC2-1
(ug/kg) Depth (ft) 0-0.5
Di-n-butylphthalate 3000
bis(2-Ethylhexyl)phthalate 1900
SSC2-2
(ug/kg) Depth (ft) 0-0.5
bis(2-Ethylhexyl)phthalate 12000
SSC2-14
(ug/kg) Depth (ft) 0-0.5
bis(2-Ethylhexyl)phthalate 12000
SSC2-24
(ug/kg) Depth (ft) 0-0.5
bis(2-Ethylhexyl)phthalate 1800
SSC2-15
(ug/kg) Depth (ft) 0-0.5
bis(2-Ethylhexyl)phthalate 2700
MWC2-2
(ug/kg) Depth (ft) 5.5-6 11.5-12 14-14.5
bis(2-Ethylhexyl)phthalate 59 400 66
SSC2-35
(ug/kg) Depth (ft) 0-0.5
bis(2-Ethylhexyl)phthalate 1700
SSC2-27
(ug/kg) Depth (ft) 0-0.5
bis(2-Ethylhexyl)phthalate 5900
SSC2-9
(ug/kg) Depth (ft) 0-0.5
bis(2-Ethylhexyl)phthalate 3300
SSC2-18
(ug/kg) Depth (ft) 0-0.5
bis(2-Ethylhexyl)phthalate 2400
SSC2-28
(ug/kg) Depth (ft) 0-0.5
bis(2-Ethylhexyl)phthalate 90000
SSC2-38
(ug/kg) Depth (ft) 0-0.5
Phenanthrene 170
bis(2-Ethylhexyl)phthalate 3500
SSC2-33
(ug/kg) Depth (ft) 0-0.5
bis(2-Ethylhexyl)phthalate 1600
SSC2-41
(ug/kg) Depth (ft) 0-0.5
2-Methylnaphthalene 89
Phenanthrene 170
SSC2-51
(ug/kg) Depth (ft) 0-0.5
Naphthalene 89
2-Methylnaphthalene 160
Fluorene 92
Phenanthrene 200
SSC2-40
(ug/kg) Depth (ft) 0-0.5
bis(2-Ethylhexyl)phthalate 3700
SSC2-50
(ug/kg) Depth (ft) 0-0.5
Naphthalene 130
2-Methylnaphthalene 270
Phenanthrene 260
Pyrene 110
Chrysene 140
Fluorene 110
SSC2-48
(ug/kg) Depth (ft) 0-0.5
Naphthalene 74
2-Methylnaphthalene 130
Fluorene 70
Phenanthrene 180
SSC2-49
(ug/kg) Depth (ft) 0-0.5
Naphthalene 120
2-Methylnaphthalene 250
Fluorene 120
Phenanthrene 260
Chrysene 140
SSC2-23
(ug/kg) Depth (ft) 0-0.5
2,4-Dimethylphenol 1100
Di-n-butylphthalate 1300
bis(2-Ethylhexyl)phthalate 8100
SSC2-44
(ug/kg) Depth (ft) 0-0.5
Pyrene 150
SSC2-45
(ug/kg) Depth (ft) 0-0.5
Phenanthrene 90
SSC2-52
(ug/kg) Depth (ft) 0-0.5
Naphthalene 130
2-Methylnaphthalene 210
Phenanthrene 210
SSC2-36
(ug/kg) Depth (ft) 0-0.5
bis(2-Ethylhexyl)phthalate 2500
SSC2-46
(ug/kg) Depth (ft) 0-0.5
bis(2-Ethylhexyl)phthalate 78
SSC2-53
(ug/kg) Depth (ft) 0-0.5
2-Methylnaphthalene 110
SSC2-54
(ug/kg) Depth (ft) 0-0.5
Phenanthrene 92
SSC2-47
(ug/kg) Depth (ft) 0-0.5
2-Methylnaphthalene 100
Phenanthrene 230
Pyrene 100
Chrysene 160
SSC2-55
(ug/kg) Depth (ft) 0-0.5
bis(2-Ethylhexyl)phthalate 110
M AVENUE
N AVENUE
ELEVENTH STREET
TWELFTH STREET
MWC2-1
MWC2-2
MWC2-3
BC2-4
BC2-5
BC2-6
BC2-7
BC2-8
BC2-9
SSC2-1
SSC2-2
SSC2-3
SSC2-4
SSC2-5
SSC2-6
SSC2-7
SSC2-8
SSC2-9
SSC2-10
SSC2-11
SSC2-12
SSC2-13
SSC2-14
SSC2-15
SSC2-16
SSC2-17
SSC2-18
SSC2-19
SSC2-20
SSC2-21
SSC2-22
SSC2-23
SSC2-24
SSC2-25
SSC2-26
SSC2-27
SSC2-28
SSC2-29
SSC2-30
SSC2-31
SSC2-32
SSC2-33
SSC2-34
SSC2-35
SSC2-36
SSC2-37
SSC2-38
SSC2-39
SSC2-40
SSC2-41
SSC2-42
SSC2-43
SSC2-44
SSC2-45
SSC2-46
SSC2-47
SSC2-48
SSC2-49
SSC2-50
SSC2-51
SSC2-52
SSC2-53
SSC2-54
SSC2-55
LEGEND:
Canonie Boring Location
Canonie Surface Sample Location
Canonie Monitoring Well Location
Fence
Storm Sewer Line
Manhole
Catch Basin
NOTES:
Boring and monitoring well locations were obtained from a base map provided by Canonie Environmental, Inc. The individual locations were digitized onto a base map CAD file provided by NAS Alameda.
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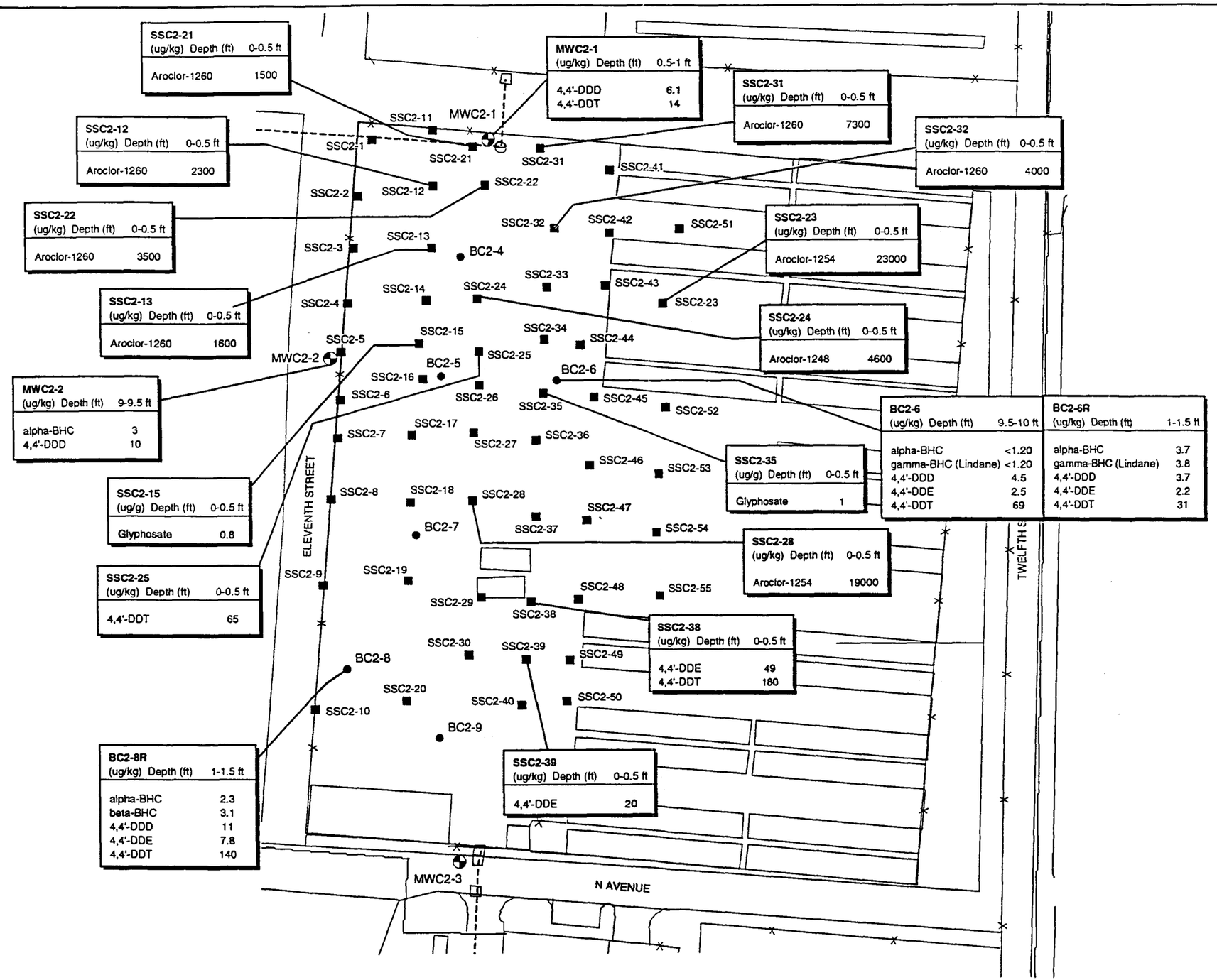
N
0 50 100
SCALE IN FEET
NAVAL AIR STATION ALAMEDA
ALAMEDA, CALIFORNIA
SITE 16 - CANS C2 AREA
SEMIVOLATILE ORGANIC COMPOUNDS
IN SOIL
FIGURE 13-4
A-24



LEGEND:

- Canonie Boring Location
- Canonie Surface Sample Location
- Canonie Monitoring Well Location
- Fence
- Storm Sewer Line
- Railroad
- Manhole
- Catch Basin

NOTES:
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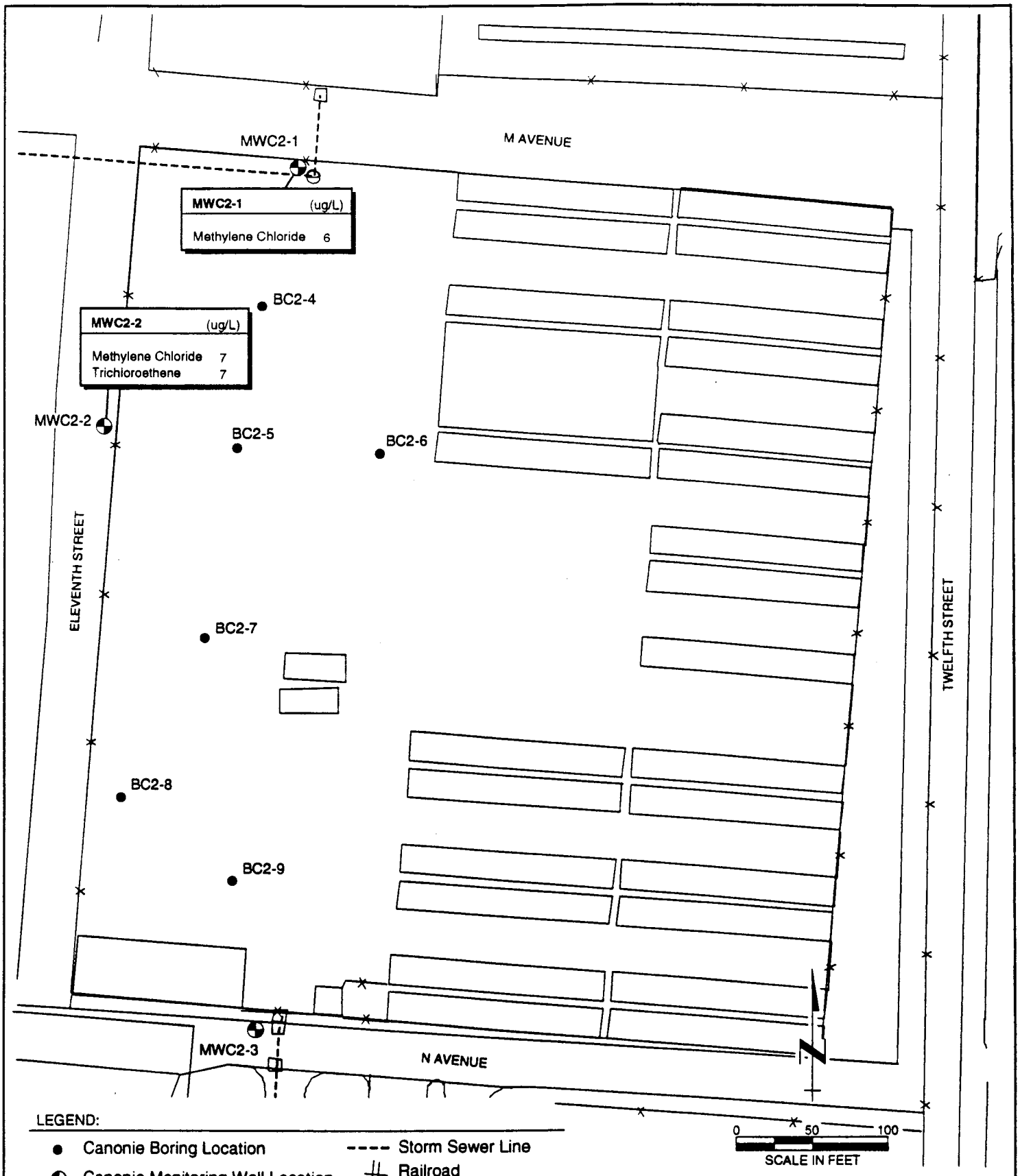
V2.A-24

NAVAL AIR STATION ALAMEDA
ALAMEDA, CALIFORNIA
SITE 16 - CANS C2 AREA
PESTICIDE AND PCB COMPOUNDS AND GLYPHOSATE IN SOIL

FIGURE 13-5



LEGEND:

- Canonie Boring Location
- Canonie Monitoring Well Location
- Fence
- Storm Sewer Line
- Railroad
- Manhole
- Catch Basin

NOTES:
Boring and monitoring well locations were obtained from a base map provided by Canonie Environmental, Inc. The individual locations were digitized onto a base map CAD file provided by NAS Alameda.

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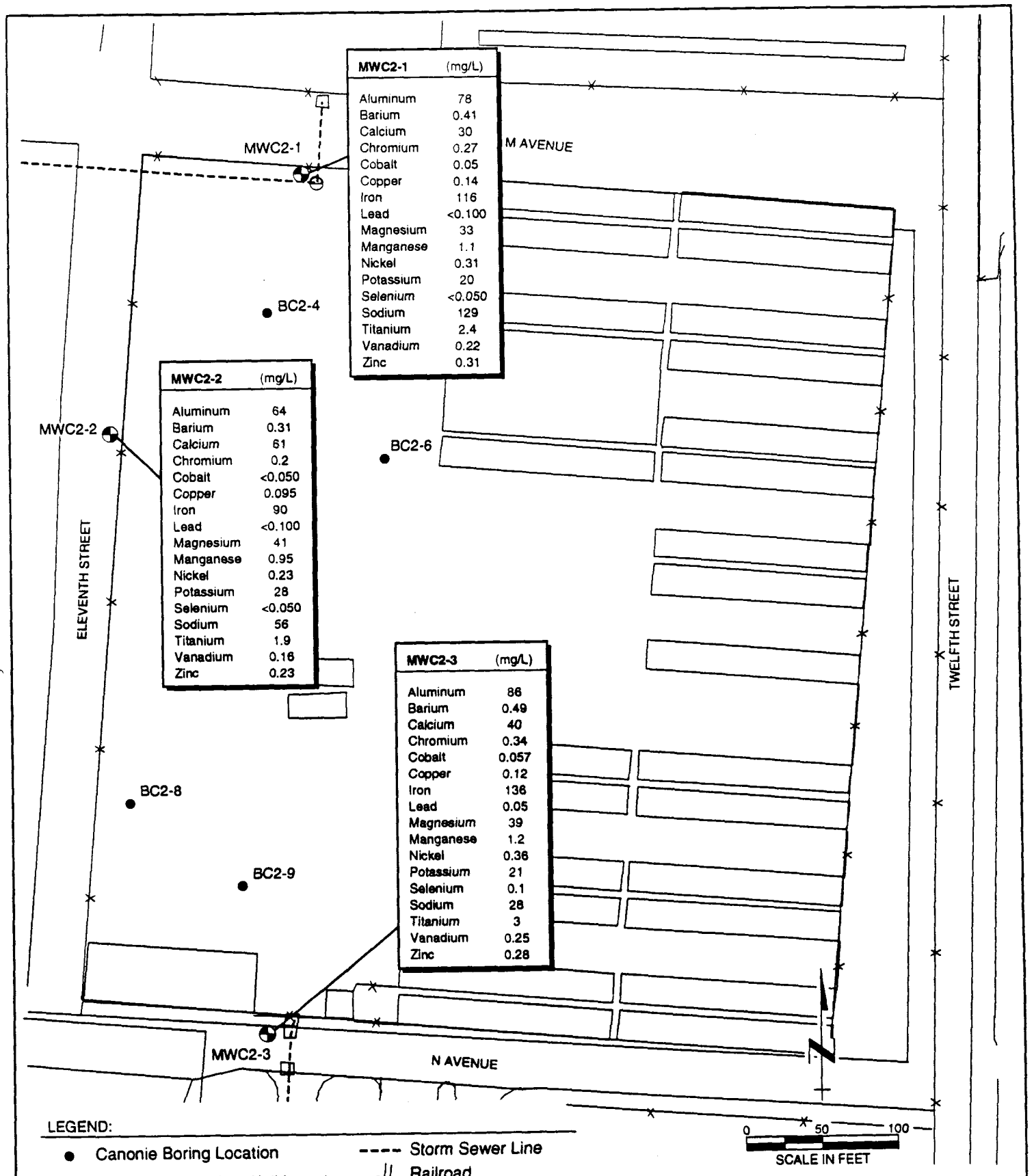
A-20

NAVAL AIR STATION ALAMEDA
ALAMEDA, CALIFORNIA

SITE 16 - CANS C2 AREA
VOLATILE ORGANIC COMPOUNDS IN GROUNDWATER

FIGURE 13-6



NOTES:
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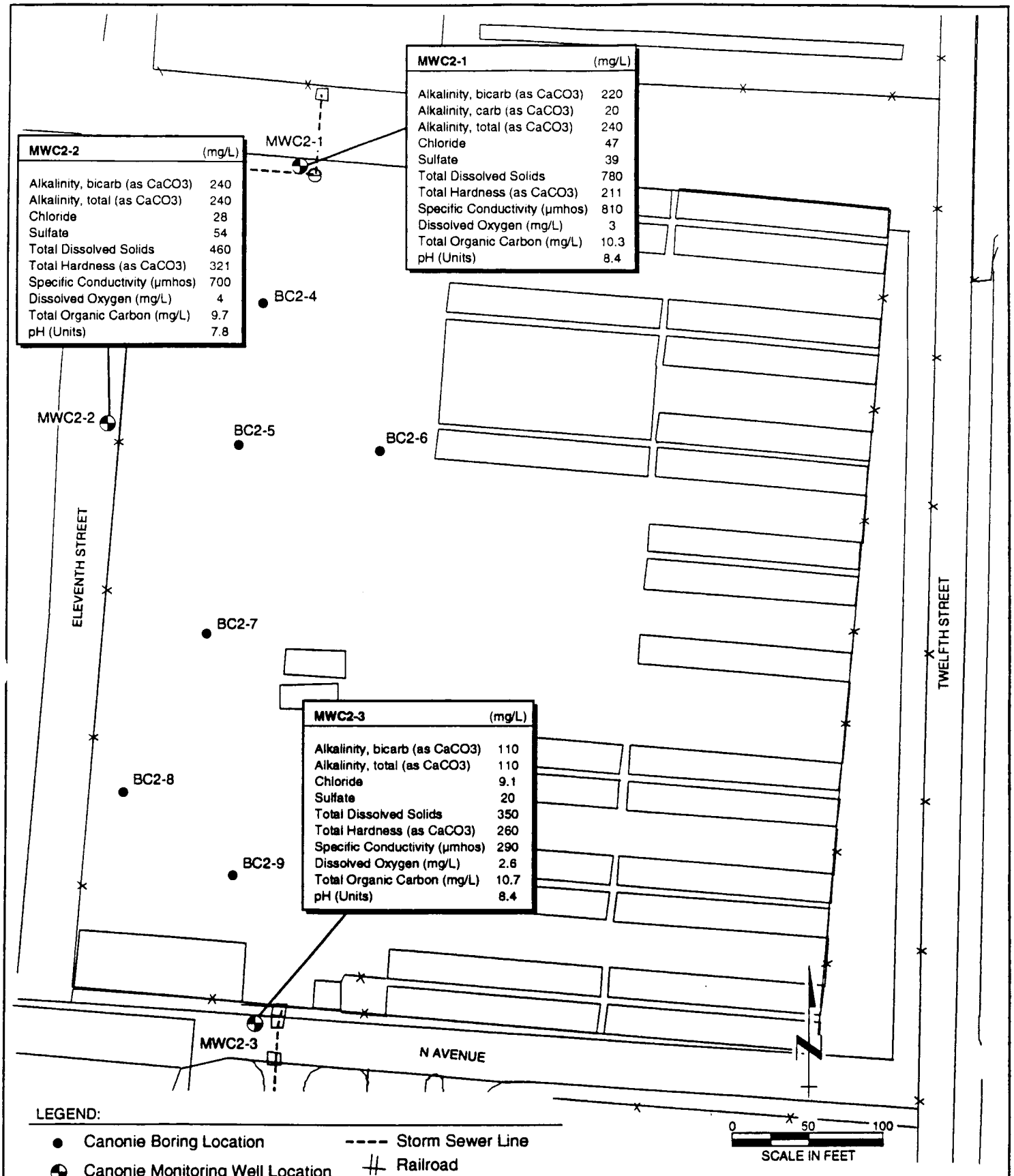
NAVAL AIR STATION ALAMEDA
ALAMEDA, CALIFORNIA
SITE 16 - CANS C2 AREA
METALS IN GROUNDWATER

FIGURE 13-7



LEGEND:

- Canonie Boring Location
- Canonie Monitoring Well Location
- Fence
- Storm Sewer Line
- Railroad
- Manhole
- Catch Basin

NOTES:
Boring and monitoring well locations were obtained from a base map provided by Canonie Environmental, Inc. The individual locations were digitized onto a base map CAD file provided by NAS Alameda.

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NAVAL AIR STATION ALAMEDA
ALAMEDA, CALIFORNIA
SITE 16 - CANS C2 AREA
GENERAL CHEMICAL CHARACTERISTICS OF GROUNDWATER
FIGURE 13-8

14.0 SITE 19 - YARD D-13, HAZARDOUS WASTE STORAGE

14.1 SITE DESCRIPTION AND BACKGROUND

Yard D-13 is located east of Ninth Street and north of K Street in an area southwest of Building 360 (Figure 1-2). The yard is enclosed by fences and encompasses approximately 1.5 acres. Building 616 is located in the northwest corner of the yard. The yard has been used to store empty 55-gallon drums and drums containing hazardous wastes generated on the base. Drums containing wastes are segregated by chemical type and stored in separate bermed areas. The surface of the yard was repaved in March 1988 (Canonie, 1990c).

14.2 CURRENT USE

Yard D-13 is currently in use for the storage of containerized hazardous wastes generated by activities on NAS Alameda.

14.3 PREVIOUS INVESTIGATIONS

No previous groundwater or soil sampling has been conducted at Yard D-13.

14.4 REMEDIAL INVESTIGATION

The focus of the field investigation at Yard D-13 was to determine if contamination from surface spills or leaks has impacted the soils and groundwater at the site. Sixteen soil borings were drilled at this site. Monitoring wells were installed in four of the 16 borings, two on the west side of the yard, one on the north side, and one on the south side of the yard. The locations of the borings and monitoring wells are presented in Figure 14-1. Monitoring wells were constructed with 2-inch, Schedule 40 PVC, each with a 10-foot screened section, installed from 5 to 15 feet bgs. The soil borings were abandoned with a cement/bentonite grout. Boring logs and construction details are presented in Appendix C.

14.4.1 Site Geology/Hydrogeology

Boring logs prepared by Canonie indicate that Site 19 is underlain by fill material, comprised of predominantly light brown silty fine sand, to depths between 8 and 13.5 feet bgs. Merritt Sand deposits consisting of orange-brown, silty fine sand to fine sand directly underlie the fill in 14 of the 16 borings drilled on-site. A thin lens of Bay Mud deposits consisting of black to dark grey clays, sand, and silty clay overlies the

Merritt Sand in two borings, BD13-11 and MWD13-3, at the southwest corner of the site. Cross sections have been constructed across the site and are presented in Figure 14-2. Geotechnical laboratory analyses are summarized in Table 14-1 and provided in Appendix D.

Groundwater was encountered at depths between 4.5 and 7.5 feet bgs during drilling. Groundwater measurements taken by Canonie on November 8, 1990 ranged between 6.04 and 7.49 feet bgs with an overall gradient of 0.001 foot/foot to the southwest (Figure 2-4). Localized gradients within the site varied in direction and magnitude. Groundwater samples collected from wells MWD13-1 through MWD13-4 contained TDS concentrations ranging from 440 to 1,360 mg/l.

14.4.2 Analytical Results - Soil Samples

A total of 174 soil samples were taken from 16 borings at Site 19; of these 174 samples, 170 were field samples and four were duplicate samples. Soil samples were analyzed for VOCs, SVOCs, TRPH, pesticide and PCB compounds, TOC, metals, cations/anions and pH, cyanide, and general chemical characteristics. Table 14-2 summarizes the analyses by sample.

14.4.2.1 Volatile Organic Compounds. Eighty soil samples were analyzed for the presence of VOCs. All 80 had detectable concentrations of one or more of 12 different VOCs. Table 14-3 summarizes the results and Figure 14-3 shows the locations of the borings where the VOCs were detected. The VOCs detected were methylene chloride, acetone, carbon disulfide, 1,1-DCA, 2-butanone, 1,1,1-TCA, TCE, PCE, toluene, ethylbenzene, xylenes (total), and 1,3-dichlorobenzene. Only one soil sample, which was collected at 1.5 feet from MWD13-2, contained total VOC concentrations greater than 1 mg/kg.

14.4.2.2 Semivolatile Organic Compounds. Sixty-five soil samples were analyzed for the presence of SVOCs. Fifty of the samples had detectable concentrations of one or more of 18 different SVOCs. The results are summarized in Table 14-4, and shown on Figure 14-4. The SVOCs detected are naphthalene, diethyl-phthalate, fluorene, n-nitroso-di-phenylamine, pentachlorophenol, phenanthrene, anthracene, di-n-butylphthalate, fluoranthene, pyrene, benzo(a)anthracene, chrysene, bis(2-ethylhexyl)phthalate, benzo(b)fluoranthene, benzo(k)-fluoranthene, benzo(a)pyrene, indeno(1,2,3-cd)pyrene, and benzo(g,h,i)perylene, several of which are PAH compounds. Only one soil sample, which was collected at 1.5 feet from MWD13-2, contained total SVOC concentrations exceeding 10 mg/kg.

14.4.2.3 Total Recoverable Petroleum Hydrocarbons. Eighty-one soil samples were analyzed for TRPH. Thirty-six of these samples were reported with detectable concentrations. The results are summarized in

Table 14-5 and are shown on Figure 14-5. Eleven soil samples contained TRPH concentrations greater than 100 mg/kg.

14.4.2.4 Pesticides/PCBs. Seventy soil samples were analyzed for pesticide/PCB compounds. One pesticide, Toxaphene, was detected in one soil sample, MWD13-4. The detection of this compound is listed on Table 14-6 and shown on Figure 14-6.

14.4.2.5 Total Organic Carbon. Sixteen soil samples were analyzed for TOC, 12 samples analyzed for cation exchange capacity, and 17 samples analyzed for pH. The results are summarized in Table 14-6. Total organic carbon results are shown on Figure 14-6.

14.4.2.6 Metals. Sixty-eight soil samples were analyzed for 22 metals. Analytical results were compared to the 95 percent/95 percent statistical tolerance interval presented in the SWAT report (Table 3-1) and to the expected values of metals in native soils (Dragun, 1988). Fifteen metals (aluminum, arsenic, barium, beryllium, calcium, chromium, cobalt, copper, iron, lead, manganese, nickel, selenium, vanadium, and zinc) were above the 95 percent/95 percent statistical tolerance limit for background concentrations in soil at NAS Alameda (PRC/JMM, 1992b). However, all sample results fell within the expected range for native soils except for 10 occurrences in nine samples, which are discussed below. Metals data are summarized and presented in Table 14-7. Magnesium was detected above the maximum of the typical concentration range, 6,000 mg/kg, in three samples at 10,800, 13,000 and 23,000 mg/kg. Two other metals were detected at concentrations above the expected range, but significantly below the upper limit of the extreme range: copper (five samples) and lead (two samples).

14.4.2.7 Cations/Anions and pH. Twelve samples were analyzed for cation exchange capacity (CEC), and 17 samples were analyzed for pH. The results are summarized in Table 14-8.

14.4.2.8 General Chemical Characteristics. Miscellaneous measurements were collected from 23 samples and include ash (16 samples), chloride (11 samples), sulfate (one sample), total Kjeldahl nitrogen (one sample), total phosphorus (one sample), and total cyanide (6 samples). Table 14-9 summarizes these data.

14.4.3 Analytical Results - Groundwater Samples

Four groundwater samples were collected, one each from the four monitoring wells at this site, MWD13-1, MWD13-2, MWD13-3, and MWD13-4, and were analyzed for the following parameters, VOCs,

SVOCs, metals, TRPH, TOC, pesticides/PCBs, cation/anions, and miscellaneous measurements. Table 14-2 provides a summary of analyses by sample.

14.4.3.1 Volatile Organic Compounds. Three VOCs, methylene chloride, 1,1-DCA, and 1,2-DCE, were detected in one or more of the four monitoring wells. Methylene chloride was detected in the samples from all four wells. 1,1-dichloroethane was detected in the samples from wells MWD13-1, MWD13-3 and MWD13-4. 1,2-dichloroethene was detected in the sample from well MWD13-1. The data are summarized in Table 14-10 and shown on Figure 14-7.

14.4.3.2 Semivolatile Organic Compounds. No SVOCs were detected in the four monitoring wells.

14.4.3.3 Total Recoverable Petroleum Hydrocarbons. TRPH and oil and grease were detected in one monitoring well, MWD13-2. The results are summarized in Table 14-10 and are shown on Figure 14-7.

14.4.3.4 Pesticides/PCBs. One pesticide, 4,4'-DDT, was detected in one monitoring well, MWD13-2. The detection of this compound is listed on Table 14-10 and shown on Figure 14-7.

14.4.3.5 Metals. The samples collected from the four monitoring wells were analyzed for 20 native elements and the analytical results compared to the 95 percent/95 percent statistical tolerance interval presented in the SWAT report (Table 3-2) and to the expected values of metals in groundwater (Dragun, 1988). According to the Canonie QAPP and QA/QC plan, groundwater samples for metals were field filtered as appropriate with a 0.45 micron filter (Canonie, 1990b). Concentrations of one or more of the 20 metals detected in one or more of the four groundwater samples were compared to Natural Concentrations of Various Elements in Groundwater (Dragun, 1988). Fifteen metals (aluminum, arsenic, barium, beryllium, calcium, chromium, cobalt, copper, iron, lead, manganese, nickel, selenium, vanadium, and zinc) were above the 95 percent/95 percent statistical tolerance limit for background concentrations in groundwater at NAS Alameda (PRC/JMM, 1992b). Fifteen metals were also detected at concentrations above the typical range: aluminum, arsenic, barium, cadmium, calcium, chromium, cobalt, copper, iron, manganese, nickel, potassium, selenium, titanium and vanadium. However, four of these elements, calcium, iron, manganese, and potassium, had concentrations below the upper limit of the extreme range. One metal, vanadium, was detected at concentrations above the extreme expected value. The metals results are summarized in Table 14-11 and shown on Figure 14-8.

14.4.3.6 Total Organic Carbon, CEC, Dissolved Oxygen, and pH. Detectable concentrations of TOC were reported in two monitoring wells, MWD13-1 and MWD13-2, and are listed in Table 14-10 and

shown on Figure 14-9. Specific conductivity, dissolved oxygen, and pH were measured and are summarized in Table 14-12 and shown on Figure 14-9.

14.4.3.7 General Chemical Characteristics. Additional groundwater quality parameters were measured and are summarized in Table 14-12 and shown on Figure 14-9. These measurements include: bicarbonate alkalinity (as $CaCO_3$); carbonate alkalinity (as $CaCO_3$); hydrox alkalinity (as $CaCO_3$); total alkalinity (as $CaCO_3$); chloride, sulfate, TDS, total hardness (as $CaCO_3$), and total cyanide.

14.5 SUMMARY AND CONCLUSIONS

The purpose of the data summary report is to provide a qualitative assessment of the Canonie data to identify whether sufficient information has been collected for the RI/FS evaluation. As discussed in Section 3, QA/QC information is not available for the data validation; therefore, the data presented in this report have not been validated under EPA CLP procedures.

14.5.1 Soils

At Site 19, Canonie collected 174 subsurface soil samples from depths of 0.5 to 15.0 feet. The samples were acquired from 16 borings. The site is underlain by fill material. Fourteen of the 16 borings encountered Merritt Sand deposits at a depths between 8 and 13.5 feet. Two borings, BD13-11 and MWD13-3, penetrated a thin lens of Bay Mud overlying the Merritt Sand. The water table was reported to be between 4.5 and 7.5 feet bgs.

VOCs, SVOCs, metals, and TRPH were found in the soils at Site 19. A pesticide, Toxaphene, was detected in one sample from MWD13-4.

Two VOCs, methylene chloride and toluene, were detected in all but two of the 80 samples from the 16 borings that were analyzed for VOCs, and acetone was detected in 52 samples, including at least one from each boring. The occurrences of methylene chloride and acetone in so many samples raises the possibility that they are laboratory artifacts. Xylenes (total) were detected in six samples from four borings in the northern half of the site. The occurrence of fuel components in soil is highly variable. Toluene was observed in all borings with the highest concentration being a near-surface sample, collected from Boring MWD13-2, west of Building 616. Within a majority of the borings, the maximum concentrations occurred near or slightly below the water table. TRPH analyses indicate that where concentrations in borings exceeded 100 mg/kg, the occurrences were primarily in the shallowest samples.

As described above, there are virtually no fuel hydrocarbons in the groundwater. 2-butanone was detected in five samples from five borings in the southern part of the site. Carbon disulfide, 1,1,1-TCA, PCE, and ethylbenzene were each detected in two samples, and 1,1-DCA, TCE, and 1,3-dichlorobenzene were each detected in one sample. With the exception of 1,3-dichlorobenzene, in one shallow sample these compounds were less than 8 μg/kg. Only one soil sample, which was collected from MWD13-2, contained total VOC concentrations greater than 1 mg/kg.

One or more of 18 SVOCs were detected throughout the site in 50 samples from several depths in 13 of the 16 borings. SVOCs were detected in soils to depths of 15 feet. Only one soil sample, which was collected from MWD13-2, contained total SVOC concentrations greater than 10 mg/kg.

Twenty-two different metals were detected in the 68 boring samples that were analyzed for metals. Of these, there were 64 occurrences in 25 samples involving 15 elements (aluminum, arsenic, barium, cadmium, calcium, chromium, copper, iron, lead, magnesium, manganese, nickel, sodium, thallium, and zinc) that were above the 95 percent/95 percent statistical tolerance interval for background concentrations in soils at NAS Alameda (PRC/JMM, 1992c). However, for the same group of samples, there were only ten occurrences in nine samples involving three metals (manganese, copper, and lead) that were above the expected range for native soils (Dragun, 1988; Table 3-2).

Total cyanide was detected in five of 69 soil samples that were analyzed.

Various other analyses were performed on the soil samples to determine pH; cation exchange capacity; TOC, percent ash; and concentrations of chloride, nitrate, sulfate, total Kjeldahl nitrogen, and total phosphorus.

If the analytical results can be validated and are considered to be acceptable, the following conclusions can be made:

- Only one soil sample (collected from boring MWD13-2) contained concentrations of SVOCs that exceeded the corresponding preliminary comparison levels.
- Because of the level of toluene and the levels of SVOCs detected in boring MWD13-2, sufficient data are not available to evaluate the extent of VOCs and SVOCs in the northwest portion of the site.
- The site appears to have been impacted by petroleum hydrocarbons. Because TRPH analysis includes both the light and heavy fraction of petroleum hydrocarbons, additional soil investigation should be conducted to characterize the distribution the light and heavy fractions of petroleum hydrocarbons in site soil.
- Sufficient soil metals data have been collected for the RI/FS evaluation.

The significance of the presence of these VOCs, SVOCs, TRPH, and metals will be further evaluated during the risk assessment to be performed during the comprehensive RI/FS work.

14.5.2 Groundwater

SVOCs were not detected in any of the four groundwater samples from the four monitoring wells.

TRPH and oil and grease were detected only in the groundwater sample from MWD13-2. This corresponds with a relatively high TRPH result in soil at 9 feet. Analyses for PCBs and pesticides detected one pesticide in the groundwater sample from MWD13-1. Pesticides were not detected in soil at this location. One or more VOCs and total cyanide were detected in all four groundwater samples. All VOCs were less than 12 μg/L.

Twenty different metals were detected in the four groundwater samples. There were 46 detections of 15 element (aluminum, arsenic, barium, beryllium, calcium, chromium, cobalt, copper, iron, lead, manganese, nickel, selenium, vanadium, and zinc) that were above the 95 percent/95 percent statistical tolerance interval for background concentrations in groundwater at NAS Alameda (PRC/JMM, 1992c). For these same samples, there were 45 occurrences of 15 metals (aluminum, arsenic, barium, cadmium, calcium, chromium, cobalt, copper, iron, manganese, nickel, potassium, selenium, titanium, and vanadium) that were above the expected range for native groundwater (Dragun, 1988; Table 3-2).

The groundwater samples were also analyzed for pH, dissolved oxygen, TOC, specific conductivity, bicarbonate alkalinity, carbonate alkalinity, total alkalinity, chloride, sulfate, TDS, and total hardness.

If the analytical results can be validated and are considered to be acceptable, the following conclusions can be made:

- Groundwater within localized areas in the vicinity of monitoring wells MWD13-1, MWD13-2, MWD13-3, and MWD13-4 may have been impacted by VOCs, SVOCS, and TRPH. Additional groundwater data will be required to evaluate the presence of these chemicals in groundwater.
- Metals are present in the groundwater at concentrations that exceed the 95 percent/95 percent statistical tolerance interval. Additional data will be required to characterize the groundwater quality and to understand the seasonal impact on the groundwater quality at this site.
- Additional groundwater monitoring well(s) in the central part of the site are required to evaluate the extent of petroleum hydrocarbons in this area of the site.

- Additional TDS data are required to evaluate whether groundwater beneath the site is considered potential drinking water.

- At present, no information is available to evaluate the tidal influence to the groundwater and the deeper water-bearing zone. Additional work is required to evaluate the tidal influence on this site and the deeper water-bearing zone.

The significance of the presence of these VOCs, SVOCs, TRPH, and metals will be further evaluated during the risk assessment to be performed during the comprehensive RI/FS work.

TABLE 14-1

SITE 19 - YARD D-13, HAZARDOUS WASTE STORAGE
GEOTECHNICAL SAMPLE LABORATORY TEST RESULTS

Sample No.	Depth (ft)	Soil Classification Laboratory	Soil Classification Field	Moisture Content (%)	Dry Density (pcf)	Specific Gravity	Hydraulic Conductivity (cm/s)
MWD13-1	2	SP/SM	SM	5.5	94.9	2.67	4.00E-04
MWD13-1	2.5	NA	SM	7.8	98.2	NA	NA
MWD13-1	9	NA	SM/SC	17.9	108.9	NA	NA
MWD13-2	7.5	NA	SM	18.1	107.3	NA	NA
MWD13-2	10	NA	SM	35.6	74.1	NA	NA
BD13-6	7	SP/SM	SM	16.1	109.1	2.66	3.00E-04
BD13-7	9.5	SM	SM/SC	17.7	110.2	NA	NA
BD13-7	10	SC	SM/SC	16.8	109.6	2.59	1.00E-07
BD13-9	7.5	SP	SM/SP	12.3	107.6	NA	NA
BD13-9	9.5	SP/SM	SP/SC	NA	NA	2.61	NA
BD13-10	9.5	SM	CL	NA	NA	NA	NA
BD13-11	3	SP/SM	SM	NA	NA	NA	NA
BD13-11	7.5	GW	SM	NA	NA	NA	NA
BD13-11	10	CL/SC	SM	NA	NA	NA	NA
BD13-11	14.5	SM	SC	14.6	115.8	NA	NA
BD13-12	6.5	SM	SC	20.8	98.3	NA	NA
BD13-12	7.5	SM/SC	SC	NA	NA	NA	NA
BD13-13	9	SM	SM	NA	NA	NA	NA
BD13-15	3.5	SP	SM	NA	NA	2.66	NA
BD13-15	14	SP/SM	SM	17.0	109.1	NA	NA
BD13-16	3.5	SP	SM	10.1	101.6	NA	NA

Notes:
NA - Not Analyzed
Parameters not detectect are reported as less than method detection limit.

Laboratory Methods (Units):
Soil Classification - Unified Soil Classification System (USCS) - ASTM D2488
Moisture Content - ASTM D2216 (percent)
Dry Density - ASTM D2937 (pounds per cubic foot)
Specific Gravity - ASTM D854
Hydraulic Conductivity - EPA 9100 (centimeters per second)

Soil Classification Legend:

GW Well graded gravels, gravel-sand mixtures, little or no fines

GP Poorly graded gravels, gravel-sand mixtures, little or no fines

GM Silty gravels, gravel-sand-silt mixtures

GC Clayey gravels, gravel-sand-clay mixtures

SW Well graded sands, gravelly sands, little or no fines

SP Poorly-graded sands, gravelly sands, little or no fines

SM Silty sands, sand-silt mixtures

SC Clayey sands, sand-clay mixtures

ML Inorganic silts and very fine sands, rock flou silty or clayey fine sands or clayey silts with slight plasticity

CL Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, silty clays, lean clays

OL Organic silts and organic silty clays or low plasticity

CH Inorganic clays of high plasticity, fat clays

TABLE 14-2

SITE 19 - YARD D-13, HAZARDOUS WASTE STORAGE
SUMMARY OF LABORATORY ANALYSES PERFORMED ON SOIL AND GROUNDWATER SAMPLES
(Sheet 1 of 7)

Boring	Depth	Matrix	Alkalinity/Acidity	Ammonia	Ammonium	Asbestos (Tot)	Ash (Tot)	SVOC	BTU Value	Cations/Anions	CEC	Cyanide (Tot)	DO (Tot)	EDB	Herb Uniq	Herbicides	Mercury	Metals	Pest/PCB	pH	Phosphorous	Potassium	Radiation	Spec. Con.	Kjeldahl Nitrogen	TOC	TRPH	TRPH/Oil&Grease	TS/TDS	VOC
BD13-5	0.5-1.0	Soil					•				•						•	•								•				
BD13-5	1.0-1.5	Soil			•		•	•	•	•										•				•	•		•			
BD13-5	2.0-2.5	Soil					•																						•	
BD13-5	2.5-3.0	Soil									•						•	•	•								•			
BD13-5	5.0-5.5	Soil																											•	
BD13-5	5.5-6.0	Soil					•				•						•	•									•			
BD13-5	9.5-10.0	Soil																											•	
BD13-5	10.0-10.5	Soil					•				•						•	•									•			
BD13-5	11.0-11.5	Soil																											•	
BD13-5	11.5-12.0	Soil																									•			
BD13-5	14.0-14.5	Soil																											•	
BD13-6	0.5-1.0	Soil					•				•						•	•												
BD13-6	1.0-1.5	Soil				•		•	•	•															•		•			
BD13-6	2.0-2.5	Soil					•																						•	
BD13-6	2.5-3.0	Soil									•						•	•	•								•			
BD13-6	5.0-5.5	Soil					•																						•	
BD13-6	5.5-6.0	Soil									•						•	•									•			
BD13-6	8.0-8.5	Soil					•																						•	
BD13-6	8.5-9.0	Soil									•						•	•									•			
BD13-6	9.5-10.0	Soil									•						•	•									•			
BD13-6	11.0-11.5	Soil																											•	
BD13-6	14.0-14.5	Soil																											•	
BD13-7	0.5-1.0	Soil					•				•						•	•												
BD13-7	1.0-1.5	Soil				•		•	•	•															•		•			
BD13-7	1.5-2.0	Soil					•																						•	
BD13-7	2.0-2.5	Soil									•						•	•	•								•			
BD13-7	4.5-5.0	Soil					•																						•	
BD13-7	5.0-5.5	Soil									•						•	•									•			

TABLE 14-2

SITE 19 - YARD D-13, HAZARDOUS WASTE STORAGE
SUMMARY OF LABORATORY ANALYSES PERFORMED ON SOIL AND GROUNDWATER SAMPLES
(Sheet 2 of 7)

Boring	Depth	Matrix	Alkalinity/Acidity	Ammonia	Ammonium	Asbestos (Tot)	Ash (Tot)	SVOC	BTU Value	Cations/Anions	CEC	Cyanide (Tot)	DO (Tot)	EDB	Herb Uniq	Herbicides	Mercury	Metals	Pest/PCB	pH	Phosphorous	Potassium	Radiation	Spec. Con.	Kjeldahl Nitrogen	TOC	TRPH	TRPH/Oil&Grease	TS/TDS	VOC
BD13-7	8.0-8.5	Soil					•				•						•	•									•		•	
BD13-7	8.5-9.0	Soil																												
BD13-7	11.0-11.5	Soil																												
BD13-7	11.5-12.0	Soil																												
BD13-7	14.0-14.5	Soil																												
BD13-7R	5.5-6.0	Soil									•						•	•									•		•	
BD13-8	0.5-1.0	Soil					•				•						•	•									•			
BD13-8	1.0-1.5	Soil				•		•	•	•														•						
BD13-8	2.5-3.0	Soil					•																						•	
BD13-8	3.0-3.5	Soil									•						•	•	•								•			
BD13-8	6.0-6.5	Soil																											•	
BD13-8	8.0-8.5	Soil																									•			
BD13-8	10.5-11.0	Soil					•																						•	
BD13-8	11.0-11.5	Soil									•						•	•									•			
BD13-8	12.5-13.0	Soil					•																						•	
BD13-8	13.0-13.5	Soil									•						•	•									•			
BD13-8	14.5-15.0	Soil																											•	
BD13-8R	3.5-4.0	Soil									•						•	•	•								•			
BD13-9	0.5-1.0	Soil					•		•		•						•	•									•			
BD13-9	1.0-1.5	Soil				•		•		•														•						
BD13-9	2.0-2.5	Soil																											•	
BD13-9	3.5-4.0	Soil									•						•	•	•								•			
BD13-9	5.0-5.5	Soil					•																						•	
BD13-9	8.0-8.5	Soil									•						•	•									•			
BD13-9	8.5-9.0	Soil																											•	
BD13-9	11.0-11.5	Soil																									•			
BD13-9	11.5-12.0	Soil																											•	
BD13-9	14.0-14.5	Soil					•																						•	

TABLE 4-2

SITE 19 - YARD D-13, HAZARDOUS WASTE STORAGE
SUMMARY OF LABORATORY ANALYSES PERFORMED ON SOIL AND GROUNDWATER SAMPLES
(Sheet 3 of 7)

Boring	Depth	Matrix	Alkalinity/Acidity	Ammonia	Ammonium	Asbestos (Tot)	Ash (Tot)	SVOC	BTU Value	Cations/Anions	CEC	Cyanide (Tot)	DO (Tot)	EDB	Herb Uniq	Herbicides	Mercury	Metals	Pest/PCB	pH	Phosphorous	Potassium	Radiation	Spec. Con.	Kjeldahl Nitrogen	TOC	TRPH	TRPH/Oil&Grease	TS/TDS	VOC
BD13-9	14.5-15.0	Soil									•						•	•									•			
BD13-10	0.5-1.0	Soil									•						•	•	•											
BD13-10	1.5-2.0	Soil				•		•		•															•					
BD13-10	2.0-2.5	Soil					•																						•	
BD13-10	3.0-3.5	Soil									•						•	•									•			
BD13-10	4.5-5.0	Soil																											•	
BD13-10	5.0-5.5	Soil																									•			
BD13-10	7.5-8.0	Soil					•																						•	
BD13-10	8.0-8.5	Soil									•						•	•									•			
BD13-10	10.5-11.0	Soil																											•	
BD13-10	11.0-11.5	Soil																									•			
BD13-10	13.5-14.0	Soil					•																						•	
BD13-10	14.0-14.5	Soil									•						•	•									•			
BD13-11	1.0-1.5	Soil					•										•	•									•			
BD13-11	1.5-2.0	Soil				•		•		•															•					
BD13-11	2.5-3.0	Soil																											•	
BD13-11	4.0-4.5	Soil					•										•	•	•											
BD13-11	6.0-6.5	Soil																									•		•	
BD13-11	9.0-9.5	Soil																									•		•	
BD13-11	11.5-12.0	Soil					•										•	•												
BD13-11	12.5-13.0	Soil																									•		•	
BD13-11	13.0-13.5	Soil					•										•	•												
BD13-11	15.0-15.5	Soil																•											•	
BD13-12	1.5-2.0	Soil					•				•						•	•												
BD13-12	2.0-2.5	Soil																											•	
BD13-12	3.0-3.5	Soil				•		•	•	•															•		•			
BD13-12	4.5-5.0	Soil					•				•						•	•	•											
BD13-12	5.0-5.5	Soil																									•		•	

TABLE 14-2

SITE 19 - YARD D-13, HAZARDOUS WASTE STORAGE
SUMMARY OF LABORATORY ANALYSES PERFORMED ON SOIL AND GROUNDWATER SAMPLES
(Sheet 4 of 7)

Boring	Depth	Matrix	Alkalinity/Acidity	Ammonia	Ammonium	Asbestos (Tot)	Ash (Tot)	SVOC	BTU Value	Cations/Anions	CEC	Cyanide (Tot)	DO (Tot)	EDB	Herb Uniq	Herbicides	Mercury	Metals	Pest/PCB	pH	Phosphorous	Potassium	Radiation	Spec. Con.	Kjeldahl Nitrogen	TOC	TRPH	TRPH/Oil&Grease	TS/TDS	VOC
BD13-12	8.5-9.0	Soil									•						•	•									•		•	
BD13-12	9.5-10.0	Soil					•				•						•	•												
BD13-12	10.5-11.0	Soil																									•		•	
BD13-12	12.0-12.5	Soil																									•		•	
BD13-12	14.5-15.0	Soil					•				•						•	•												
BD13-12	15.0-15.5	Soil																									•		•	
BD13-12R	14.0-14.5	Soil					•																							
BD13-13	2.0-2.5	Soil					•										•	•									•			
BD13-13	2.5-3.0	Soil				•		•	•															•						
BD13-13	7.0-7.5	Soil																											•	
BD13-13	8.0-8.5	Soil					•										•	•	•											
BD13-13	8.5-9.0	Soil																									•		•	
BD13-13	9.5-10.0	Soil																									•		•	
BD13-13	11.0-11.5	Soil					•										•	•												
BD13-13	12.0-12.5	Soil																									•		•	
BD13-13	14.0-14.5	Soil					•										•	•												
BD13-13	14.5-15.0	Soil					•																							
BD13-13	15.0-15.5	Soil																									•		•	
BD13-14	2.0-2.5	Soil					•				•						•	•												
BD13-14	2.5-3.0	Soil				•		•	•															•			•			
BD13-14	3.5-4.0	Soil																											•	
BD13-14	4.0-4.5	Soil					•				•						•	•	•											
BD13-14	9.5-10.0	Soil																									•		•	
BD13-14	13.5-14.0	Soil																									•		•	
BD13-14	14.0-14.5	Soil					•				•						•	•												
BD13-14	14.5-15.0	Soil																									•		•	
BD13-14	15.0-15.5	Soil					•				•						•	•												
BD13-14	15.5-16.0	Soil																									•		•	

TABLE 14-2

SITE 19 - YARD D-13, HAZARDOUS WASTE STORAGE
SUMMARY OF LABORATORY ANALYSES PERFORMED ON SOIL AND GROUNDWATER SAMPLES
(Sheet 5 of 7)

Boring	Depth	Matrix	Alkalinity/Acidity	Ammonia	Ammonium	Asbestos (Tot)	Ash (Tot)	SVOC	BTU Value	Cations/Anions	CEC	Cyanide (Tot)	DO (Tot)	EDB	Herb Uniq	Herbicides	Mercury	Metals	Pest/PCB	pH	Phosphorous	Potassium	Radiation	Spec. Con.	Kjeldahl Nitrogen	TOC	TRPH	TRPH/Oil&Grease	TS/TDS	VOC
BD13-15	2.0-2.5	Soil					•										•	•								•				
BD13-15	2.5-3.0	Soil				•		•																	•					
BD13-15	4.0-4.5	Soil																											•	
BD13-15	8.5-9.0	Soil					•										•	•	•											
BD13-15	10.5-11.0	Soil																									•		•	
BD13-15	11.5-12.0	Soil																									•		•	
BD13-15	12.5-13.0	Soil					•										•	•												
BD13-15	13.0-13.5	Soil																									•		•	
BD13-15	13.5-14.0	Soil					•										•	•												
BD13-15	14.5-15.0	Soil																•											•	
BD13-16	1.5-2.0	Soil					•										•	•									•			
BD13-16	2.0-2.5	Soil				•		•																	•					
BD13-16	3.0-3.5	Soil																											•	
BD13-16	5.0-5.5	Soil					•										•	•	•											
BD13-16	6.0-6.5	Soil																									•		•	
BD13-16	9.0-9.5	Soil																									•		•	
BD13-16	10.5-11.0	Soil					•										•	•												
BD13-16	12.0-12.5	Soil																									•		•	
BD13-16	13.5-14.0	Soil					•										•	•												
BD13-16	14.0-14.5	Soil																									•		•	
BD13-9R	4.0-4.5	Soil					•										•	•									•			
MWD13-1	0.5-1.0	Soil					•										•	•									•			
MWD13-1	1.0-1.5	Soil				•		•	•	•															•					
MWD13-1	3.5-4.0	Soil																											•	
MWD13-1	7.0-7.5	Soil					•										•	•	•											
MWD13-1	8.5-9.0	Soil																									•		•	
MWD13-1	9.5-10.0	Soil																									•		•	
MWD13-1	10.0-10.5	Soil					•										•	•												

TABLE 14-2

SITE 19 - YARD D-13, HAZARDOUS WASTE STORAGE
SUMMARY OF LABORATORY ANALYSES PERFORMED ON SOIL AND GROUNDWATER SAMPLES
(Sheet 6 of 7)

Boring	Depth	Matrix	Alkalinity/Acidity	Ammonia	Ammonium	Asbestos (Tot)	Ash (Tot)	SVOC	BTU Value	Cations/Anions	CEC	Cyanide (Tot)	DO (Tot)	EDB	Herb Uniq	Herbicides	Mercury	Metals	Pest/PCB	pH	Phosphorous	Potassium	Radiation	Spec. Con.	Kjeldahl Nitrogen	TOC	TRPH	TRPH/Oil&Grease	TS/TDS	VOC
MWD13-1	12.5-13.0	Soil																									•		•	
MWD13-1	13.0-13.5	Soil					•										•	•												
MWD13-1	14.0-14.5	Soil																									•		•	
MWD13-2	0.5-1.0	Soil					•										•	•												
MWD13-2	1.5-2.0	Soil					•												•										•	
MWD13-2	2.0-2.5	Soil															•	•									•			
MWD13-2	3.5-4.0	Soil				•		•		•	•													•						
MWD13-2	5.0-5.5	Soil																											•	
MWD13-2	5.5-6.0	Soil																									•			
MWD13-2	8.5-9.0	Soil					•																						•	
MWD13-2	9.0-9.5	Soil															•	•									•			
MWD13-2	13.0-13.5	Soil					•																						•	
MWD13-2	13.5-14.0	Soil															•	•									•			
MWD13-2	14.5-15.0	Soil																											•	
MWD13-2	15.0-15.5	Soil																									•			
MWD13-3	0.5-1.0	Soil					•										•	•												
MWD13-3	2.0-2.5	Soil				•		•		•									•					•						
MWD13-3	3.5-4.0	Soil																									•		•	
MWD13-3	4.0-4.5	Soil					•																						•	
MWD13-3	5.0-5.5	Soil															•	•									•			
MWD13-3	11.5-12.0	Soil					•																						•	
MWD13-3	12.0-12.5	Soil															•	•									•			
MWD13-3	14.0-14.5	Soil					•																						•	
MWD13-3	14.5-15.0	Soil															•	•									•			
MWD13-4	2.5-3.0	Soil					•				•						•	•												
MWD13-4	3.0-3.5	Soil				•		•	•	•														•			•			
MWD13-4	4.0-4.5	Soil																											•	
MWD13-4	4.5-5.0	Soil					•				•						•	•	•											

TABLE 14-2

SITE 19 - YARD D-13, HAZARDOUS WASTE STORAGE
SUMMARY OF LABORATORY ANALYSES PERFORMED ON SOIL AND GROUNDWATER SAMPLES
(Sheet 7 of 7)

Boring	Depth	Matrix	Alkalinity/Acidity	Ammonia	Ammonium	Asbestos (Tot)	Ash (Tot)	SVOC	BTU Value	Cations/Anions	CEC	Cyanide (Tot)	DO (Tot)	EDB	Herb Uniq	Herbicides	Mercury	Metals	Pest/PCB	pH	Phosphorous	Potassium	Radiation	Spec. Con.	Kjeldahl Nitrogen	TOC	TRPH	TRPH/Oil&Grease	TS/TDS	VOC
MWD13-4	9.5-10.0	Soil																									•			•
MWD13-4	10.0-10.5	Soil																									•			•
MWD13-4	10.5-11.0	Soil					•				•						•	•												
MWD13-4	14.0-14.5	Soil																									•			•
MWD13-4	14.5-15.0	Soil					•				•						•	•												
MWD13-4	15.0-15.5	Soil																									•			•
Summary		**Soil**			1		16	65	16	10	12	40						68	70	17	1				1	16		81			80
MWD13-1	0.0	Water	•					•		•		•	•					•	•	•				•		•	•	•	•	•
MWD13-2	0.0	Water	•					•		•		•	•					•	•	•				•		•	•	•	•	•
MWD13-3	0.0	Water	•					•		•		•	•					•	•	•				•		•	•	•	•	•
MWD13-4	0.0	Water	•					•		•		•	•					•	•	•				•		•	•	•	•	•
Summary		**Water**	4					4		4		4	4					4	4	4				4		4		4	4	4

Notes:

Analysis	Methods	Matrix
Misc		
Phosphorus	ASA #9 24-2.3	soil
TKN	ASA #9 31-3	soil
TDS	EPA 160.1	water
Sulfate	EPA 300.0	water
Chloride	EPA 300.0	water
Acidity	EPA 305.1	water
Alkalinity	EPA 310.1	water
Alkalinity	EPA SM403	water
Ammonium	EPA/CE81-1	soil
Hardness	SM 314A	water
Foaming Agents	EPA 425.1	water

Analysis	Methods	Matrix
BTU	ASTM D1102-56	soil
ASH	ASTM D3286-73	soil
ASH	EPA SM302H	soil
DO	DO	water
Spec Con	EPA 120.1	water
Metals	EPA 200.7	water
Metals	EPA 6010	soil
Tot Cyanide	EPA 335.2	soil
Tot Cyanide	EPA 9010	water
Oil & Grease	EPA 413.1	water
TOC	EPA 415.2	water

Analysis	Methods	Matrix
TRPH	EPA 418.1	water
Pest/PCB	EPA 608	water
Pest/PCB	EPA 8080	soil
VOC	EPA 8240	soil
VOC	EPA 624	water
SVOC	EPA 8240	soil
SVOC	EPA 8270	soil
pH	EPA 9045	water
CEC	USBR 514.8-4	soil

TABLE 14-3

SITE 19 - YARD D-13, HAZARDOUS WASTE STORAGE AREA
RESULTS FOR VOLATILE ORGANIC COMPOUNDS DETECTED IN SOIL SAMPLES
(Sheet 1 of 12)

Parameter Reported	BD13-10 07/05/90 2-2.5 ft	BD13-10 07/05/90 4.5-5 ft	BD13-10 07/05/90 7.5-8 ft	BD13-10 07/05/90 10.5-11 ft	BD13-10 07/05/90 13.5-14 ft	BD13-11 07/10/90 2.5-3 ft	BD13-11 07/10/90 6-6.5 ft
Methylene Chloride (ug/kg)	30	19	17	17	21	8	13
Acetone (ug/kg)	4	4	11	7	8 BJ	59	19
Carbon Disulfide (ug/kg)	<8.00	<6.00	<6.00	<6.00	<6.00	<5.00	1
1,1-Dichloroethane (ug/kg)	<8.00	<6.00	<6.00	<6.00	<6.00	<5.00	<6.00
2-Butanone (ug/kg)	<16.0	<11.0	<12.0	<12.0	<12.0	2	<11.0
1,1,1-Trichloroethane (ug/kg)	<8.00	<6.00	<6.00	<6.00	<6.00	<5.00	1
Trichloroethene (ug/kg)	4	<6.00	<6.00	<6.00	<6.00	<5.00	<6.00
Tetrachloroethene (ug/kg)	4	2	<6.00	<6.00	<6.00	<5.00	<6.00
Toluene (ug/kg)	5	24	11	46	20	8	150
Ethylbenzene (ug/kg)	<8.00	<6.00	<6.00	<6.00	<6.00	<5.00	<6.00
Xylenes (total) (ug/kg)	3	<6.00	<6.00	<6.00	<6.00	<5.00	<6.00
1,3-Dichlorobenzene (ug/kg)	<8.00	<6.00	<6.00	<6.00	<6.00	<5.00	<6.00

Notes: NA = Not Analyzed
< = Detection Limit
ug/kg = micrograms per kilogram
Data not validated by JMM

TABLE 14-3

SITE 19 - YARD D-13, HAZARDOUS WASTE STORAGE AREA
RESULTS FOR VOLATILE ORGANIC COMPOUNDS DETECTED IN SOIL SAMPLES
(Sheet 2 of 12)

Parameter Reported	BD13-11 07/10/90 9-9.5 ft	BD13-11 07/10/90 12.5-13 ft	BD13-11 07/09/90 15-15.5 ft	BD13-12 07/09/90 2-2.5 ft	BD13-12 07/09/90 5-5.5 ft	BD13-12 07/09/90 8.5-9 ft	BD13-12 07/09/90 10.5-11 ft
Methylene Chloride (ug/kg)	11	13	9	8	12	10	10
Acetone (ug/kg)	18	39 B	8	<10.0	<12.0	23	12
Carbon Disulfide (ug/kg)	<6.00	<6.00	<6.00	<5.20	<6.10	<6.50	<6.00
1,1-Dichloroethane (ug/kg)	<6.00	<6.00	<6.00	<5.20	<6.10	<6.50	<6.00
2-Butanone (ug/kg)	<13.0	<12.0	<12.0	<10.0	<12.0	<13.0	<12.0
1,1,1-Trichloroethane (ug/kg)	<6.00	<6.00	<6.00	<5.20	<6.10	<6.50	<6.00
Trichloroethene (ug/kg)	<6.00	<6.00	<6.00	<5.20	<6.10	<6.50	<6.00
Tetrachloroethene (ug/kg)	<6.00	<6.00	<6.00	<5.20	<6.10	<6.50	<6.00
Toluene (ug/kg)	55	21	14	11	76	29	140
Ethylbenzene (ug/kg)	<6.00	<6.00	<6.00	<5.20	<6.10	<6.50	<6.00
Xylenes (total) (ug/kg)	<6.00	<6.00	<6.00	<5.20	<6.10	<6.50	<6.00
1,3-Dichlorobenzene (ug/kg)	<6.00	<6.00	<6.00	NA	NA	NA	NA

Notes: NA = Not Analyzed
< = Detection Limit
ug/kg = micrograms per kilogram
Data not validated by JMM

TABLE 14-3

SITE 19 - YARD D-13, HAZARDOUS WASTE STORAGE AREA
RESULTS FOR VOLATILE ORGANIC COMPOUNDS DETECTED IN SOIL SAMPLES
(Sheet 3 of 12)

Parameter Reported	BD13-12 07/09/90 12-12.5 ft	BD13-12 07/09/90 15-15.5 ft	BD13-13 07/09/90 7-7.5 ft	BD13-13 07/11/90 8.5-9 ft	BD13-13 07/09/90 9.5-10 ft	BD13-13 07/09/90 12-12.5 ft	BD13-13 07/09/90 15-15.5 ft
Methylene Chloride (ug/kg)	11	12	8	10	11 B	12	19
Acetone (ug/kg)	<12.0	<12.0	43	31 B	25	13	49
Carbon Disulfide (ug/kg)	<6.00	<5.90	<6.00	<6.00	<6.00	<6.00	<6.00
1,1-Dichloroethane (ug/kg)	<6.00	<5.90	<6.00	<6.00	<6.00	<6.00	<6.00
2-Butanone (ug/kg)	<12.0	<12.0	2	<12.0	<12.0	<12.0	<12.0
1,1,1-Trichloroethane (ug/kg)	<6.00	<5.90	<6.00	<6.00	<6.00	<6.00	<6.00
Trichloroethene (ug/kg)	<6.00	<5.90	<6.00	<6.00	<6.00	<6.00	<6.00
Tetrachloroethene (ug/kg)	<6.00	<5.90	<6.00	<6.00	<6.00	<6.00	<6.00
Toluene (ug/kg)	41	100	11	20	10	13	21
Ethylbenzene (ug/kg)	<6.00	<5.90	<6.00	<6.00	<6.00	<6.00	<6.00
Xylenes (total) (ug/kg)	<6.00	<5.90	<6.00	<6.00	<6.00	<6.00	<6.00
1,3-Dichlorobenzene (ug/kg)	NA	NA	NA	NA	NA	NA	NA

Notes: NA = Not Analyzed
< = Detection Limit
ug/kg = micrograms per kilogram
Data not validated by JMM

TABLE 14-3

SITE 19 - YARD D-13, HAZARDOUS WASTE STORAGE AREA
RESULTS FOR VOLATILE ORGANIC COMPOUNDS DETECTED IN SOIL SAMPLES
(Sheet 4 of 12)

Parameter Reported	BD13-14 07/09/90 3.5-4 ft	BD13-14 07/09/90 9.5-10 ft	BD13-14 07/09/90 13.5-14 ft	BD13-14 07/09/90 14.5-15 ft	BD13-14 07/09/90 15.5-16 ft	BD13-15 07/10/90 4-4.5 ft	BD13-15 07/10/90 10.5-11 ft
Methylene Chloride (ug/kg)	9	13	12	14	11	13	14
Acetone (ug/kg)	<10.0	13	<12.0	<12.0	<12.0	11	14
Carbon Disulfide (ug/kg)	<5.20	<6.50	<5.90	<6.20	<6.00	<6.00	<6.00
1,1-Dichloroethane (ug/kg)	<5.20	<6.50	<5.90	<6.20	<6.00	<6.00	1
2-Butanone (ug/kg)	<10.0	<13.0	<12.0	<12.0	<12.0	<11.0	<11.0
1,1,1-Trichloroethane (ug/kg)	<5.20	<6.50	<5.90	<6.20	<6.00	<6.00	<6.00
Trichloroethene (ug/kg)	<5.20	<6.50	<5.90	<6.20	<6.00	<6.00	<6.00
Tetrachloroethene (ug/kg)	<5.20	<6.50	<5.90	<6.20	<6.00	<6.00	<6.00
Toluene (ug/kg)	14	100	25	28	34	160	23
Ethylbenzene (ug/kg)	<5.20	<6.50	<5.90	<6.20	<6.00	<6.00	<6.00
Xylenes (total) (ug/kg)	<5.20	<6.50	<5.90	<6.20	<6.00	<6.00	<6.00
1,3-Dichlorobenzene (ug/kg)	NA	NA	NA	NA	NA	<6.00	<6.00

Notes: NA = Not Analyzed
< = Detection Limit
ug/kg = micrograms per kilogram
Data not validated by JMM

TABLE 14-3

SITE 19 - YARD D-13, HAZARDOUS WASTE STORAGE AREA
RESULTS FOR VOLATILE ORGANIC COMPOUNDS DETECTED IN SOIL SAMPLES
(Sheet 5 of 12)

Parameter Reported	BD13-15 07/10/90 11.5-12 ft	BD13-15 07/10/90 13-13.5 ft	BD13-15 07/09/90 14.5-15 ft	BD13-16 07/10/90 3-3.5 ft	BD13-16 07/10/90 6-6.5 ft	BD13-16 07/10/90 9-9.5 ft	BD13-16 07/10/90 12-12.5 ft
Methylene Chloride (ug/kg)	12	14	16	13	14	24	21
Acetone (ug/kg)	6	5	7	33	21	49	32
Carbon Disulfide (ug/kg)	<6.00	<6.00	<6.00	<5.00	<6.00	4	<6.00
1,1-Dichloroethane (ug/kg)	<6.00	<6.00	<6.00	<5.00	<6.00	<6.00	<6.00
2-Butanone (ug/kg)	<12.0	<12.0	<12.0	<11.0	<13.0	3	<12.0
1,1,1-Trichloroethane (ug/kg)	<6.00	<6.00	<6.00	<5.00	3	<6.00	<6.00
Trichloroethene (ug/kg)	<6.00	<6.00	<6.00	<5.00	<6.00	<6.00	<6.00
Tetrachloroethene (ug/kg)	<6.00	<6.00	<6.00	<5.00	<6.00	<6.00	<6.00
Toluene (ug/kg)	24	16	22	2	4	36	8
Ethylbenzene (ug/kg)	<6.00	<6.00	<6.00	<5.00	<6.00	<6.00	<6.00
Xylenes (total) (ug/kg)	<6.00	<6.00	<6.00	<5.00	<6.00	<6.00	<6.00
1,3-Dichlorobenzene (ug/kg)	<6.00	<6.00	<6.00	<5.00	<6.00	<6.00	<6.00

Notes: NA = Not Analyzed
< = Detection Limit
ug/kg = micrograms per kilogram
Data not validated by JMM

TABLE 14-3

SITE 19 - YARD D-13, HAZARDOUS WASTE STORAGE AREA
RESULTS FOR VOLATILE ORGANIC COMPOUNDS DETECTED IN SOIL SAMPLES
(Sheet 6 of 12)

Parameter Reported	BD13-16 07/10/90 14-14.5 ft	BD13-5 07/03/90 2-2.5 ft	BD13-5 07/03/90 5-5.5 ft	BD13-5 07/03/90 9.5-10 ft	BD13-5 07/03/90 11-11.5 ft	BD13-5 07/03/90 14-14.5 ft	BD13-6 07/03/90 2-2.5 ft
Methylene Chloride (ug/kg)	13	16	19	20	17	14	28
Acetone (ug/kg)	30	<11.0	17	<12.0	<12.0	<12.0	<10.0
Carbon Disulfide (ug/kg)	<6.00	<5.40	<6.00	<5.90	<5.90	<5.90	<5.20
1,1-Dichloroethane (ug/kg)	<6.00	<5.40	<6.00	<5.90	<5.90	<5.90	<5.20
2-Butanone (ug/kg)	<12.0	<11.0	<12.0	<12.0	<12.0	<12.0	<10.0
1,1,1-Trichloroethane (ug/kg)	<6.00	<5.40	<6.00	<5.90	<5.90	<5.90	<5.20
Trichloroethene (ug/kg)	<6.00	<5.40	<6.00	<5.90	<5.90	<5.90	<5.20
Tetrachloroethene (ug/kg)	<6.00	<5.40	<6.00	<5.90	<5.90	<5.90	<5.20
Toluene (ug/kg)	12	22	74	56	11	13	10
Ethylbenzene (ug/kg)	<6.00	<5.40	<6.00	8	<5.90	<5.90	<5.20
Xylenes (total) (ug/kg)	<6.00	21	<6.00	51	<5.90	<5.90	<5.20
1,3-Dichlorobenzene (ug/kg)	<6.00	NA	NA	NA	NA	NA	NA

Notes: NA = Not Analyzed
< = Detection Limit
ug/kg = micrograms per kilogram
Data not validated by JMM

TABLE 14-3

SITE 19 - YARD D-13, HAZARDOUS WASTE STORAGE AREA
RESULTS FOR VOLATILE ORGANIC COMPOUNDS DETECTED IN SOIL SAMPLES
(Sheet 7 of 12)

Parameter Reported	BD13-6 07/03/90 5-5.5 ft	BD13-6 07/03/90 8-8.5 ft	BD13-6 07/03/90 11-11.5 ft	BD13-6 07/03/90 14-14.5 ft	BD13-7 07/03/90 1.5-2 ft	BD13-7 07/03/90 4.5-5 ft	BD13-7 07/03/90 8-8.5 ft
Methylene Chloride (ug/kg)	21	28	18	34	31	32	37
Acetone (ug/kg)	<12.0	17	<12.0	<12.0	<12.0	<23.0	20
Carbon Disulfide (ug/kg)	<5.90	<6.00	<6.00	<5.90	<6.20	<11.0	<5.80
1,1-Dichloroethane (ug/kg)	<5.90	<6.00	<6.00	<5.90	<6.20	<11.0	<5.80
2-Butanone (ug/kg)	<12.0	<12.0	<12.0	<12.0	<12.0	<23.0	<12.0
1,1,1-Trichloroethane (ug/kg)	<5.90	<6.00	<6.00	<5.90	<6.20	<11.0	<5.80
Trichloroethene (ug/kg)	<5.90	<6.00	<6.00	<5.90	<6.20	<11.0	<5.80
Tetrachloroethene (ug/kg)	<5.90	<6.00	<6.00	<5.90	<6.20	<11.0	<5.80
Toluene (ug/kg)	100	35	27	36	58	280	10
Ethylbenzene (ug/kg)	<5.90	<6.00	<6.00	6	<6.20	<11.0	<5.80
Xylenes (total) (ug/kg)	<5.90	<6.00	13	45	<6.20	<11.0	<5.80
1,3-Dichlorobenzene (ug/kg)	NA	NA	NA	NA	NA	NA	NA

Notes: NA = Not Analyzed
< = Detection Limit
ug/kg = micrograms per kilogram
Data not validated by JMM

TABLE 14-3

SITE 19 - YARD D-13, HAZARDOUS WASTE STORAGE AREA
RESULTS FOR VOLATILE ORGANIC COMPOUNDS DETECTED IN SOIL SAMPLES
(Sheet 8 of 12)

Parameter Reported	BD13-7 07/03/90 11-11.5 ft	BD13-7 07/03/90 14-14.5 ft	BD13-8 07/03/90 2.5-3 ft	BD13-8 07/03/90 6-6.5 ft	BD13-8 07/03/90 10.5-11 ft	BD13-8 07/03/90 12.5-13 ft	BD13-8 07/03/90 14.5-15 ft
Methylene Chloride (ug/kg)	34	33	9	11	13	14	9
Acetone (ug/kg)	<12.0	<12.0	32	59	99	27	11
Carbon Disulfide (ug/kg)	<5.80	<6.00	<5.00	<6.00	<6.00	<6.00	<6.00
1,1-Dichloroethane (ug/kg)	<5.80	<6.00	<5.00	<6.00	<6.00	<6.00	<6.00
2-Butanone (ug/kg)	<12.0	<12.0	<10.0	<13.0	3	<12.0	<12.0
1,1,1-Trichloroethane (ug/kg)	<5.80	<6.00	<5.00	<6.00	<6.00	<6.00	<6.00
Trichloroethene (ug/kg)	<5.80	<6.00	<5.00	<6.00	<6.00	<6.00	<6.00
Tetrachloroethene (ug/kg)	<5.80	<6.00	<5.00	<6.00	<6.00	<6.00	<6.00
Toluene (ug/kg)	49	17	39	5	22	19	28
Ethylbenzene (ug/kg)	<5.80	<6.00	<5.00	<6.00	<6.00	<6.00	<6.00
Xylenes (total) (ug/kg)	<5.80	<6.00	<5.00	<6.00	<6.00	<6.00	<6.00
1,3-Dichlorobenzene (ug/kg)	NA	NA	<340	<6.00	<6.00	<6.00	<6.00

Notes: NA = Not Analyzed
< = Detection Limit
ug/kg = micrograms per kilogram
Data not validated by JMM

TABLE 14-3

SITE 19 - YARD D-13, HAZARDOUS WASTE STORAGE AREA
RESULTS FOR VOLATILE ORGANIC COMPOUNDS DETECTED IN SOIL SAMPLES
(Sheet 9 of 12)

Parameter Reported	BD13-9 07/03/90 2-2.5 ft	BD13-9 07/03/90 5-5.5 ft	BD13-9 07/05/90 8.5-9 ft	BD13-9 07/18/90 11.5-12 ft	BD13-9 07/03/90 14-14.5 ft	MWD13-1 07/11/90 3.5-4 ft	MWD13-1 07/11/90 8.5-9 ft
Methylene Chloride (ug/kg)	14	17	18	14	15	9	15
Acetone (ug/kg)	46	55	37	60	20	8	22
Carbon Disulfide (ug/kg)	<5.00	<6.00	<6.00	<6.00	<6.00	<6.00	<6.00
1,1-Dichloroethane (ug/kg)	<5.00	<6.00	<6.00	<6.00	<6.00	<6.00	<6.00
2-Butanone (ug/kg)	<11.0	<12.0	4	<12.0	<12.0	<11.0	<12.0
1,1,1-Trichloroethane (ug/kg)	<5.00	<6.00	<6.00	<6.00	<6.00	<6.00	<6.00
Trichloroethene (ug/kg)	<5.00	<6.00	<6.00	<6.00	<6.00	<6.00	<6.00
Tetrachloroethene (ug/kg)	<5.00	<6.00	<6.00	<6.00	<6.00	<6.00	<6.00
Toluene (ug/kg)	48	20	31	21	5	34	17
Ethylbenzene (ug/kg)	<5.00	<6.00	<6.00	<6.00	<6.00	<6.00	<6.00
Xylenes (total) (ug/kg)	<5.00	<6.00	<6.00	<6.00	<6.00	<6.00	<6.00
1,3-Dichlorobenzene (ug/kg)	<5.00	<6.00	<6.00	<6.00	<6.00	NA	NA

Notes: NA = Not Analyzed
< = Detection Limit
ug/kg = micrograms per kilogram
Data not validated by JMM

TABLE 14-3

SITE 19 - YARD D-13, HAZARDOUS WASTE STORAGE AREA
RESULTS FOR VOLATILE ORGANIC COMPOUNDS DETECTED IN SOIL SAMPLES
(Sheet 10 of 12)

Parameter Reported	MWD13-1 07/11/90 9.5-10 ft	MWD13-1 07/11/90 12.5-13 ft	MWD13-1 07/11/90 14-14.5 ft	MWD13-2 07/06/90 1.5-2 ft	MWD13-2 07/27/90 5-5.5 ft	MWD13-2 07/27/90 8.5-9 ft	MWD13-2 07/27/90 13-13.5 ft
Methylene Chloride (ug/kg)	9	9	8	<1400	11	4	10
Acetone (ug/kg)	10	34	37	<1400	31	16	10
Carbon Disulfide (ug/kg)	<6.00	<6.00	<6.00	<680	<6.00	<6.00	<6.00
1,1-Dichloroethane (ug/kg)	<6.00	<6.00	<6.00	<680	<6.00	<6.00	<6.00
2-Butanone (ug/kg)	<12.0	<12.0	<12.0	<1400	<12.0	<12.0	<12.0
1,1,1-Trichloroethane (ug/kg)	<6.00	<6.00	<6.00	<680	<6.00	<6.00	<6.00
Trichloroethene (ug/kg)	<6.00	<6.00	<6.00	<680	<6.00	<6.00	<6.00
Tetrachloroethene (ug/kg)	<6.00	<6.00	<6.00	<680	<6.00	<6.00	<6.00
Toluene (ug/kg)	36	30	18	1000	4	37	25
Ethylbenzene (ug/kg)	<6.00	<6.00	<6.00	<680	<6.00	<6.00	<6.00
Xylenes (total) (ug/kg)	<6.00	<6.00	<6.00	190	<6.00	<6.00	<6.00
1,3-Dichlorobenzene (ug/kg)	NA	NA	NA	590	<6.00	<6.00	<6.00

Notes: NA = Not Analyzed
< = Detection Limit
ug/kg = micrograms per kilogram
Data not validated by JMM

TABLE 14-3

SITE 19 - YARD D-13, HAZARDOUS WASTE STORAGE AREA
RESULTS FOR VOLATILE ORGANIC COMPOUNDS DETECTED IN SOIL SAMPLES
(Sheet 11 of 12)

Parameter Reported	MWD13-2 07/06/90 14.5-15 ft	MWD13-3 07/27/90 3.5-4 ft	MWD13-3 07/06/90 4-4.5 ft	MWD13-3 07/06/90 11.5-12 ft	MWD13-3 07/06/90 14-14.5 ft	MWD13-4 07/09/90 4-4.5 ft	MWD13-4 07/09/90 9.5-10 ft
Methylene Chloride (ug/kg)	10	11	11	14	11	14	13
Acetone (ug/kg)	3	7	25	67	9	<12.0	18
Carbon Disulfide (ug/kg)	<6.00	<6.00	<6.00	<7.00	<6.00	<5.80	<5.60
1,1-Dichloroethane (ug/kg)	<6.00	<6.00	<6.00	<7.00	<6.00	<5.80	<5.60
2-Butanone (ug/kg)	<12.0	<11.0	<12.0	<15.0	<12.0	<12.0	<11.0
1,1,1-Trichloroethane (ug/kg)	<6.00	<6.00	<6.00	<7.00	<6.00	<5.80	<5.60
Trichloroethene (ug/kg)	<6.00	<6.00	<6.00	<7.00	<6.00	<5.80	<5.60
Tetrachloroethene (ug/kg)	<6.00	<6.00	<6.00	<7.00	<6.00	<5.80	<5.60
Toluene (ug/kg)	5	54	45	16	<6.00	7	46
Ethylbenzene (ug/kg)	<6.00	<6.00	<6.00	<7.00	<6.00	<5.80	<5.60
Xylenes (total) (ug/kg)	<6.00	<6.00	<6.00	<7.00	<6.00	<5.80	<5.60
1,3-Dichlorobenzene (ug/kg)	<6.00	<6.00	<6.00	<7.00	<6.00	NA	NA

Notes: NA = Not Analyzed
< = Detection Limit
ug/kg = micrograms per kilogram
Data not validated by JMM

TABLE 14-3

SITE 19 - YARD D-13, HAZARDOUS WASTE STORAGE AREA
RESULTS FOR VOLATILE ORGANIC COMPOUNDS DETECTED IN SOIL SAMPLES
(Sheet 12 of 12)

Parameter Reported	MWD13-4 07/09/90 10-10.5 ft	MWD13-4 07/09/90 14-14.5 ft	MWD13-4 07/09/90 15-15.5 ft
Methylene Chloride (ug/kg)	21	17	18
Acetone (ug/kg)	<13.0	<12.0	<12.0
Carbon Disulfide (ug/kg)	<6.30	<6.00	<6.10
1,1-Dichloroethane (ug/kg)	<6.30	<6.00	<6.10
2-Butanone (ug/kg)	<13.0	<12.0	<12.0
1,1,1-Trichloroethane (ug/kg)	<6.30	<6.00	<6.10
Trichloroethene (ug/kg)	<6.30	<6.00	<6.10
Tetrachloroethene (ug/kg)	<6.30	<6.00	<6.10
Toluene (ug/kg)	16	25	52
Ethylbenzene (ug/kg)	<6.30	<6.00	<6.10
Xylenes (total) (ug/kg)	<6.30	<6.00	<6.10
1,3-Dichlorobenzene (ug/kg)	NA	NA	NA

Notes: NA = Not Analyzed
< = Detection Limit
ug/kg = micrograms per kilogram
Data not validated by JMM

TABLE 14-4

SITE 19 - YARD D-13, HAZARDOUS WASTE STORAGE
RESULTS FOR SEMIVOLATILE ORGANIC COMPOUNDS DETECTED IN SOIL SAMPLES
(Sheet 1 of 8)

Parameter Reported	BD13-10 07/05/90 2-2.5 ft	BD13-10 07/05/90 7.5-8 ft	BD13-10 07/05/90 13.5-14 ft	BD13-11 07/10/90 1-1.5 ft	BD13-11 07/10/90 4-4.5 ft	BD13-11 07/10/90 11.5-12 ft	BD13-11 07/10/90 13-13.5 ft
Naphthalene (ug/kg)	56	<390	<390	<700	<750	<380	<800
Diethylphthalate (ug/kg)	<520	<390	<390	<700	<750	<380	<800
Fluorene (ug/kg)	<520	<390	<390	<700	<750	<380	<800
n-Nitroso-di-phenylamine (ug/kg)	<520	<390	<390	79	98	<380	95
Pentachlorophenol (ug/kg)	<2500	<1900	<1900	410	<3600	<1900	<3900
Phenanthrene (ug/kg)	<520	<390	<390	<700	<750	<380	<800
Anthracene (ug/kg)	<520	<390	<390	<700	<750	<380	<800
Di-n-butylphthalate (ug/kg)	<520	<390	<390	<700	<750	<380	<800
Fluoranthene (ug/kg)	<520	<390	<390	<700	<750	<380	120
Pyrene (ug/kg)	<520	<390	<390	<700	<750	<380	140
Benzo(a)anthracene (ug/kg)	<520	<390	<390	<700	<750	<380	<800
Chrysene (ug/kg)	<520	<390	<390	<700	<750	<380	<800
bis(2-Ethylhexyl)phthalate (ug/kg)	110	100	190	550	110	57	150
Benzo(b)fluoranthene (ug/kg)	<520	<390	<390	<700	<750	<380	83
Benzo(k)fluoranthene (ug/kg)	<520	<390	<390	<700	<750	<380	<800
Benzo(a)pyrene (ug/kg)	<520	<390	<390	<700	<750	<380	<800
Indeno(1,2,3-cd)pyrene (ug/kg)	<520	<390	<390	<700	<750	<380	<800
Benzo(g,h,i)perylene (ug/kg)	<520	<390	<390	<700	<750	<380	<800

Notes: NA = Not Analyzed
< = Detection Limit
ug/kg = micrograms per kilogram
Data not validated by JMM

TABLE 14-4

SITE 19 - YARD D-13, HAZARDOUS WASTE STORAGE
RESULTS FOR SEMIVOLATILE ORGANIC COMPOUNDS DETECTED IN SOIL SAMPLES
(Sheet 2 of 8)

Parameter Reported	BD13-13 07/11/90 2-2.5 ft	BD13-13 07/11/90 8-8.5 ft	BD13-13 07/11/90 11-11.5 ft	BD13-13 07/11/90 14-14.5 ft	BD13-13 07/09/90 14.5-15 ft	BD13-15 07/10/90 2-2.5 ft	BD13-15 07/10/90 8.5-9 ft
Naphthalene (ug/kg)	<760	<390	<380	<390	<380	<6800	<790
Diethylphthalate (ug/kg)	<760	<390	<380	<390	<380	<6800	<790
Fluorene (ug/kg)	<760	<390	<380	<390	<380	<6800	<790
n-Nitroso-di-phenylamine (ug/kg)	110	<390	49	61	48	900	100
Pentachlorophenol (ug/kg)	<3700	<1900	<1900	<1900	<1800	<33000	<3800
Phenanthrene (ug/kg)	<760	<390	<380	<390	<380	<6800	<790
Anthracene (ug/kg)	<760	<390	<380	<390	<380	<6800	<790
Di-n-butylphthalate (ug/kg)	<760	<390	<380	<390	<380	<6800	<790
Fluoranthene (ug/kg)	79	<390	<380	<390	<380	<6800	<790
Pyrene (ug/kg)	97	<390	<380	<390	<380	<6800	<790
Benzo(a)anthracene (ug/kg)	<760	<390	<380	<390	<380	<6800	<790
Chrysene (ug/kg)	<760	<390	<380	<390	<380	<6800	<790
bis(2-Ethylhexyl)phthalate (ug/kg)	160	70	<380	58	69	<6800	150
Benzo(b)fluoranthene (ug/kg)	120	<390	<380	<390	<380	<6800	<790
Benzo(k)fluoranthene (ug/kg)	<760	<390	<380	<390	<380	<6800	<790
Benzo(a)pyrene (ug/kg)	<760	<390	<380	<390	<380	<6800	<790
Indeno(1,2,3-cd)pyrene (ug/kg)	<760	<390	<380	<390	<380	<6800	<790
Benzo(g,h,i)perylene (ug/kg)	<760	<390	<380	<390	<380	<6800	<790

Notes: NA = Not Analyzed
< = Detection Limit
ug/kg = micrograms per kilogram
Data not validated by JMM

TABLE 14-4

SITE 19 - YARD D-13, HAZARDOUS WASTE STORAGE
RESULTS FOR SEMIVOLATILE ORGANIC COMPOUNDS DETECTED IN SOIL SAMPLES
(Sheet 3 of 8)

Parameter Reported	BD13-15 07/10/90 12.5-13 ft	BD13-15 07/10/90 13.5-14 ft	BD13-16 07/10/90 1.5-2 ft	BD13-16 07/10/90 5-5.5 ft	BD13-16 07/10/90 10.5-11 ft	BD13-16 07/10/90 13.5-14 ft	BD13-5 07/03/90 2-2.5 ft
Naphthalene (ug/kg)	<380	<390	<690	<800	<800	<790	<360
Diethylphthalate (ug/kg)	<380	<390	<690	<800	<800	<790	<360
Fluorene (ug/kg)	<380	<390	<690	<800	<800	130	<360
n-Nitroso-di-phenylamine (ug/kg)	<380	55	<690	96	<800	<790	<360
Pentachlorophenol (ug/kg)	<1900	<1900	1600	670	<3900	<3900	<1700
Phenanthrene (ug/kg)	<380	<390	<690	<800	280	580	<360
Anthracene (ug/kg)	<380	<390	<690	<800	98	100	<360
Di-n-butylphthalate (ug/kg)	<380	<390	<690	<800	<800	<790	1500
Fluoranthene (ug/kg)	<380	<390	<690	<800	1000	520	<360
Pyrene (ug/kg)	<380	<390	<690	<800	930	380	<360
Benzo(a)anthracene (ug/kg)	<380	<390	100	<800	350	180	<360
Chrysene (ug/kg)	<380	<390	<690	<800	440	270	<360
bis(2-Ethylhexyl)phthalate (ug/kg)	62	99	2100	830	510	<790	<360
Benzo(b)fluoranthene (ug/kg)	<380	<390	<690	<800	420	270	<360
Benzo(k)fluoranthene (ug/kg)	<380	<390	<690	<800	170	<790	<360
Benzo(a)pyrene (ug/kg)	<380	<390	<690	<800	270	140	<360
Indeno(1,2,3-cd)pyrene (ug/kg)	<380	<390	<690	<800	<800	<790	<360
Benzo(g,h,i)perylene (ug/kg)	<380	<390	<690	<800	<800	<790	<360

Notes: NA = Not Analyzed
< = Detection Limit
ug/kg = micrograms per kilogram
Data not validated by JMM

TABLE 14-4

SITE 19 - YARD D-13, HAZARDOUS WASTE STORAGE
RESULTS FOR SEMIVOLATILE ORGANIC COMPOUNDS DETECTED IN SOIL SAMPLES
(Sheet 4 of 8)

Parameter Reported	BD13-5 07/03/90 5.5-6 ft	BD13-5 07/03/90 10-10.5 ft	BD13-6 07/03/90 0.5-1 ft	BD13-6 07/03/90 2-2.5 ft	BD13-6 07/03/90 5-5.5 ft	BD13-6 07/03/90 8-8.5 ft	BD13-7 07/03/90 0.5-1 ft
Naphthalene (ug/kg)	<400	<410	<680	<350	<390	<400	<350
Diethylphthalate (ug/kg)	<400	<410	<680	<350	<390	<400	<350
Fluorene (ug/kg)	<400	<410	<680	<350	<390	<400	<350
n-Nitroso-di-phenylamine (ug/kg)	<400	<410	<680	<350	<390	<400	<350
Pentachlorophenol (ug/kg)	<2000	<2000	<3300	<1700	<1900	<1900	<1700
Phenanthrene (ug/kg)	<400	<410	<680	<350	<390	<400	<350
Anthracene (ug/kg)	<400	<410	<680	<350	<390	<400	<350
Di-n-butylphthalate (ug/kg)	430	630	3700	570	5200	720	1400
Fluoranthene (ug/kg)	<400	<410	<680	<350	<390	<400	<350
Pyrene (ug/kg)	<400	<410	<680	<350	<390	<400	<350
Benzo(a)anthracene (ug/kg)	<400	<410	<680	<350	<390	<400	<350
Chrysene (ug/kg)	<400	<410	<680	<350	<390	<400	<350
bis(2-Ethylhexyl)phthalate (ug/kg)	<400	<410	<680	<350	<390	<400	<350
Benzo(b)fluoranthene (ug/kg)	<400	<410	<680	<350	<390	<400	<350
Benzo(k)fluoranthene (ug/kg)	<400	<410	<680	<350	<390	<400	<350
Benzo(a)pyrene (ug/kg)	<400	<410	<680	<350	<390	<400	<350
Indeno(1,2,3-cd)pyrene (ug/kg)	<400	<410	<680	<350	<390	<400	<350
Benzo(g,h,i)perylene (ug/kg)	<400	<410	<680	<350	<390	<400	<350

Notes: NA = Not Analyzed
< = Detection Limit
ug/kg = micrograms per kilogram
Data not validated by JMM

TABLE 14-4

SITE 19 - YARD D-13, HAZARDOUS WASTE STORAGE
RESULTS FOR SEMIVOLATILE ORGANIC COMPOUNDS DETECTED IN SOIL SAMPLES
(Sheet 5 of 8)

Parameter Reported	BD13-7 07/03/90 1.5-2 ft	BD13-7 07/03/90 4.5-5 ft	BD13-7 07/03/90 8-8.5 ft	BD13-8 07/05/90 0.5-1 ft	BD13-8 07/03/90 2.5-3 ft	BD13-8 07/03/90 10.5-11 ft	BD13-8 07/03/90 12.5-13 ft
Naphthalene (ug/kg)	<410	<370	<380	40	<340	<410	45
Diethylphthalate (ug/kg)	<410	<370	<380	<340	<340	<410	<390
Fluorene (ug/kg)	<410	<370	<380	<340	<340	<410	<390
n-Nitroso-di-phenylamine (ug/kg)	<410	<370	<380	<340	<340	<410	<390
Pentachlorophenol (ug/kg)	<2000	<1800	<1900	<1600	<1700	<2000	<1900
Phenanthrene (ug/kg)	<410	<370	<380	<340	<340	<410	<390
Anthracene (ug/kg)	<410	<370	<380	<340	<340	<410	<390
Di-n-butylphthalate (ug/kg)	7300	450	430	<340	<340	<410	<390
Fluoranthene (ug/kg)	<410	<370	<380	<340	<340	<410	<390
Pyrene (ug/kg)	<410	<370	<380	<340	<340	100	<390
Benzo(a)anthracene (ug/kg)	<410	<370	<380	<340	<340	72	<390
Chrysene (ug/kg)	<410	<370	<380	<340	<340	150	<390
bis(2-Ethylhexyl)phthalate (ug/kg)	<410	<370	<380	140	53	<410	69
Benzo(b)fluoranthene (ug/kg)	<410	<370	<380	<340	<340	<410	<390
Benzo(k)fluoranthene (ug/kg)	<410	<370	<380	<340	<340	<410	<390
Benzo(a)pyrene (ug/kg)	<410	<370	<380	<340	<340	<410	<390
Indeno(1,2,3-cd)pyrene (ug/kg)	<410	<370	<380	<340	<340	<410	<390
Benzo(g,h,i)perylene (ug/kg)	<410	<370	<380	<340	<340	<410	<390

Notes: NA = Not Analyzed
< = Detection Limit
ug/kg = micrograms per kilogram
Data not validated by JMM

TABLE 14-4

SITE 19 - YARD D-13, HAZARDOUS WASTE STORAGE
RESULTS FOR SEMIVOLATILE ORGANIC COMPOUNDS DETECTED IN SOIL SAMPLES
(Sheet 6 of 8)

Parameter Reported	BD13-9 07/03/90 5-5.5 ft	BD13-9 07/05/90 8.5-9 ft	BD13-9 07/03/90 14-14.5 ft	BD13-9R 07/05/90 4-4.5 ft	MWD13-1 07/11/90 7-7.5 ft	MWD13-1 07/11/90 10-10.5 ft	MWD13-1 07/11/90 13-13.5 ft
Naphthalene (ug/kg)	41	<770	<390	<370	<370	<390	<400
Diethylphthalate (ug/kg)	<400	8800	<390	<370	<370	<390	<400
Fluorene (ug/kg)	<400	<770	<390	<370	<370	<390	<400
n-Nitroso-di-phenylamine (ug/kg)	<400	<770	<390	43	48	<390	63
Pentachlorophenol (ug/kg)	<2000	<3700	<1900	<1800	<1800	<1900	<1900
Phenanthrene (ug/kg)	<400	330	<390	<370	<370	<390	<400
Anthracene (ug/kg)	<400	95	<390	<370	<370	<390	<400
Di-n-butylphthalate (ug/kg)	<400	<770	<390	<370	<370	<390	<400
Fluoranthene (ug/kg)	58	1000	<390	<370	<370	<390	<400
Pyrene (ug/kg)	380	1700	<390	<370	<370	<390	<400
Benzo(a)anthracene (ug/kg)	<400	540	<390	<370	<370	<390	<400
Chrysene (ug/kg)	<400	640	<390	<370	<370	<390	<400
bis(2-Ethylhexyl)phthalate (ug/kg)	71	250	44	64	<370	49	46
Benzo(b)fluoranthene (ug/kg)	<400	920	<390	<370	<370	<390	<400
Benzo(k)fluoranthene (ug/kg)	<400	<770	<390	<370	<370	<390	<400
Benzo(a)pyrene (ug/kg)	<400	600	<390	<370	<370	<390	<400
Indeno(1,2,3-cd)pyrene (ug/kg)	<400	400	<390	<370	<370	<390	<400
Benzo(g,h,i)perylene (ug/kg)	<400	390	<390	<370	<370	<390	<400

Notes: NA = Not Analyzed
< = Detection Limit
ug/kg = micrograms per kilogram
Data not validated by JMM

TABLE 14-4

SITE 19 - YARD D-13, HAZARDOUS WASTE STORAGE
RESULTS FOR SEMIVOLATILE ORGANIC COMPOUNDS DETECTED IN SOIL SAMPLES
(Sheet 7 of 8)

Parameter Reported	MWD13-2 07/06/90 0.5-1 ft	MWD13-2 07/06/90 1.5-2 ft	MWD13-2 07/27/90 8.5-9 ft	MWD13-2 07/27/90 13-13.5 ft	MWD13-3 07/06/90 0.5-1 ft	MWD13-3 07/06/90 4-4.5 ft	MWD13-3 07/06/90 11.5-12 ft
Naphthalene (ug/kg)	<720	<720	<400	<390	<690	<400	150
Diethylphthalate (ug/kg)	12000	6200	<400	<390	7700	<400	<970
Fluorene (ug/kg)	<720	<720	<400	<390	<690	<400	<970
n-Nitroso-di-phenylamine (ug/kg)	87	78	45	43	82	48	140
Pentachlorophenol (ug/kg)	550	640	<1900	<1900	<3300	<1900	<4700
Phenanthrene (ug/kg)	<720	<720	<400	<390	<690	<400	100
Anthracene (ug/kg)	<720	<720	<400	<390	<690	<400	<970
Di-n-butylphthalate (ug/kg)	<720	<720	<400	<390	<690	<400	120
Fluoranthene (ug/kg)	<720	<720	<400	<390	<690	<400	170
Pyrene (ug/kg)	<720	<720	<400	<390	<690	<400	210
Benzo(a)anthracene (ug/kg)	<720	<720	<400	<390	<690	<400	<970
Chrysene (ug/kg)	<720	<720	<400	<390	<690	<400	<970
bis(2-Ethylhexyl)phthalate (ug/kg)	750	890	<400	<390	310	<400	290
Benzo(b)fluoranthene (ug/kg)	<720	<720	<400	<390	<690	<400	<970
Benzo(k)fluoranthene (ug/kg)	<720	<720	<400	<390	<690	<400	<970
Benzo(a)pyrene (ug/kg)	<720	<720	<400	<390	<690	<400	<970
Indeno(1,2,3-cd)pyrene (ug/kg)	<720	<720	<400	<390	<690	<400	<970
Benzo(g,h,i)perylene (ug/kg)	<720	<720	<400	<390	<690	<400	<970

Notes: NA = Not Analyzed
< = Detection Limit
ug/kg = micrograms per kilogram
Data not validated by JMM

TABLE 14-4

SITE 19 - YARD D-13, HAZARDOUS WASTE STORAGE
RESULTS FOR SEMIVOLATILE ORGANIC COMPOUNDS DETECTED IN SOIL SAMPLES
(Sheet 8 of 8)

Parameter Reported	MWD13-3 07/06/90 14-14.5 ft
Naphthalene (ug/kg)	<390
Diethylphthalate (ug/kg)	<390
Fluorene (ug/kg)	<390
n-Nitroso-di-phenylamine (ug/kg)	44
Pentachlorophenol (ug/kg)	<1900
Phenanthrene (ug/kg)	<390
Anthracene (ug/kg)	<390
Di-n-butylphthalate (ug/kg)	<390
Fluoranthene (ug/kg)	<390
Pyrene (ug/kg)	<390
Benzo(a)anthracene (ug/kg)	<390
Chrysene (ug/kg)	<390
bis(2-Ethylhexyl)phthalate (ug/kg)	41
Benzo(b)fluoranthene (ug/kg)	<390
Benzo(k)fluoranthene (ug/kg)	<390
Benzo(a)pyrene (ug/kg)	<390
Indeno(1,2,3-cd)pyrene (ug/kg)	<390
Benzo(g,h,i)perylene (ug/kg)	<390

Notes: NA = Not Analyzed
< = Detection Limit
ug/kg = micrograms per kilogram
Data not validated by JMM

TABLE 14-5

SITE 19 - YARD 13, HAZARDOUS WASTE STORAGE
RESULTS FOR TOTAL RECOVERABLE PETROLEUM HYDROCARBONS DETECTED IN SOIL SAMPLES
(Sheet 1 of 2)

Parameter Reported	BD13-10 07/05/90 3-3.5 ft	BD13-11 07/10/90 1-1.5 ft	BD13-11 07/10/90 6-6.5 ft	BD13-11 07/10/90 9-9.5 ft	BD13-12 07/09/90 8.5-9 ft	BD13-12 07/09/90 10.5-11 ft	BD13-12 07/09/90 12-12.5 ft
TRPH (mg/kg)	19.5	2.3	1570	102	94.6	4.7	4.7

Parameter Reported	BD13-13 07/11/90 2-2.5 ft	BD13-14 07/09/90 9.5-10 ft	BD13-15 07/10/90 2-2.5 ft	BD13-15 07/10/90 10.5-11 ft	BD13-16 07/10/90 1.5-2 ft	BD13-16 07/10/90 6-6.5 ft	BD13-16 07/10/90 9-9.5 ft
TRPH (mg/kg)	9.7	9.6	14500	73.4	3070	206	586

Parameter Reported	BD13-16 07/10/90 12-12.5 ft	BD13-16 07/10/90 14-14.5 ft	BD13-5 07/03/90 2.5-3 ft	BD13-5 07/03/90 5.5-6 ft	BD13-6 07/03/90 5.5-6 ft	BD13-7 07/03/90 2-2.5 ft	BD13-8 07/05/90 0.5-1 ft
TRPH (mg/kg)	71.6	11.6	102	8.9	23.9	309	2280

Notes: NA = Not Analyzed
< = Detection Limit
mg/kg = milligrams per kilogram
Data not validated by JMM

TABLE 14-5

SITE 19 - YARD 13, HAZARDOUS WASTE STORAGE
RESULTS FOR TOTAL RECOVERABLE PETROLEUM HYDROCARBONS DETECTED IN SOIL SAMPLES
(Sheet 2 of 2)

Parameter Reported	BD13-8 07/05/90 3-3.5 ft	BD13-8 07/05/90 8-8.5 ft	BD13-8 07/05/90 11-11.5 ft	BD13-8 07/05/90 13-13.5 ft	BD13-9 07/05/90 0.5-1 ft	BD13-9 07/05/90 3.5-4 ft	BD13-9 07/05/90 8-8.5 ft
TRPH (mg/kg)	72	75.2	14.6	3.4	5310	15.4	8.6

Parameter Reported	BD13-9R 07/05/90 4-4.5 ft	MWD13-1 07/11/90 0.5-1 ft	MWD13-2 07/27/90 5.5-6 ft	MWD13-2 07/06/90 9-9.5 ft	MWD13-3 07/06/90 5-5.5 ft	MWD13-3 07/27/90 12-12.5 ft	MWD13-4 07/09/90 9.5-10 ft
TRPH (mg/kg)	13.4	2.9	29.3	12800	18.7	8.4	8.8

Parameter Reported	MWD13-4 07/09/90 10-10.5 ft
TRPH (mg/kg)	12.2

Notes: NA = Not Analyzed
< = Detection Limit
mg/kg = milligrams per kilogram
Data not validated by JMM

TABLE 14-6

SITE 19 - YARD D-13, HAZARDOUS WASTE STORAGE
RESULTS FOR TOTAL ORGANIC CARBON AND
PESTICIDE COMPOUNDS DETECTED IN SOIL SAMPLES

Parameter Reported	BD13-10 07/05/90 1.5-2 ft	BD13-11 07/10/90 1.5-2 ft	BD13-12 07/09/90 3-3.5 ft	BD13-13 07/11/90 2.5-3 ft	BD13-14 07/09/90 2.5-3 ft	BD13-15 07/10/90 2.5-3 ft	BD13-16 07/10/90 2-2.5 ft
Total Organic Carbon							
Total Organic Carbon (mg/kg)	572	519	519	572	364	519	572

Parameter Reported	BD13-8 07/05/90 1-1.5 ft	BD13-9 07/05/90 1-1.5 ft	MWD13-1 07/11/90 1-1.5 ft	MWD13-4 07/09/90 3-3.5 ft
Total Organic Carbon				
Total Organic Carbon (mg/kg)	416	416	364	572

	MWD13-4 07/09/09 4.5-5 ft
Pesticide Compounds	
Toxaphene (ug/kg)	56

Notes: NA = Not Analyzed
< = Detection Limit
mg/kg = milligrams per kilogram
ug/kg = micrograms per kilogram
Data not validated by JMM

TABLE 14-7

SITE 19 - YARD D-13, HAZARDOUS WASTE STORAGE
RESULTS FOR METALS DETECTED IN SOIL SAMPLES
(Sheet 1 of 10)

Parameter Reported	BD13-10 07/05/90 0.5-1 ft	BD13-10 07/05/90 3-3.5 ft	BD13-10 07/05/90 8-8.5 ft	BD13-10 07/05/90 14-14.5 ft	BD13-11 07/10/90 1-1.5 ft	BD13-11 07/10/90 4-4.5 ft	BD13-11 07/10/90 11.5-12 ft
Aluminum (mg/kg)	3120	6720	19500	9680	4110	3350	9590
Arsenic (mg/kg)	<10.0	<11.0	<12.0	<12.0	<2.50	<2.70	6
Barium (mg/kg)	25	570	77	60	18.2	15.3	83.3
Beryllium (mg/kg)	<1.00	<1.10	<1.20	<1.20	<0.200	<0.200	0.4
Cadmium (mg/kg)	<1.00	<1.10	<1.20	<1.20	<0.200	<0.200	<0.200
Calcium (mg/kg)	2000	84900	2500	2600	2390	1980	1970
Chromium (mg/kg)	24	18	57	43	28.2	27.6	42.8
Cobalt (mg/kg)	<5.20	<5.70	11	<6.10	3.8	3.4	6.6
Copper (mg/kg)	12	30	45	12	43.1	16.3	24.6
Iron (mg/kg)	5440	12600	21600	13900	6880	5790	14900
Lead (mg/kg)	<5.20	44	10	<6.10	<5.30	<5.70	<5.80
Magnesium (mg/kg)	1800	13000	4100	3100	2290	1430	3410
Manganese (mg/kg)	72	564	300	160	88.8	161	171
Molybdenum (mg/kg)	<5.20	<5.70	<6.00	<6.10	<1.10	<1.10	<1.20
Nickel (mg/kg)	20	17	63	43	24	21.5	52.5
Potassium (mg/kg)	<520	1000	1600	830	630	360	930
Silver (mg/kg)	<5.20	<5.70	<6.00	<6.10	<0.600	<0.700	<0.700
Sodium (mg/kg)	<520	<570	<600	<610	239	228	1060
Thallium (mg/kg)	<10.0	<11.0	<12.0	<12.0	<2.70	<3.00	<3.00
Titanium (mg/kg)	260	280	658	550	327	288	416
Vanadium (mg/kg)	14	23	42	28	15.6	14	26.7
Zinc (mg/kg)	17	35	45	26	35.7	23.7	39.3

Notes: NA = Not Analyzed
< = Detection Limit
mg/kg = milligram per kilogram
Data not validated by JMM

TABLE 14-7

SITE 19 - YARD D-13, HAZARDOUS WASTE STORAGE
RESULTS FOR METALS DETECTED IN SOIL SAMPLES
(Sheet 2 of 10)

Parameter Reported	BD13-11 07/10/90 13-13.5 ft	BD13-12 07/09/90 1.5-2 ft	BD13-12 07/09/90 4.5-5 ft	BD13-12 07/09/90 9.5-10 ft	BD13-12 07/09/90 14.5-15 ft	BD13-13 07/11/90 2-2.5 ft	BD13-13 07/11/90 8-8.5 ft
Aluminum (mg/kg)	8570	4380	5730	14100	10300	6510	9530
Arsenic (mg/kg)	4.2	<10.0	<12.0	<12.0	<12.0	8.8	4
Barium (mg/kg)	72.8	<21.0	31	90	82	305	64.4
Beryllium (mg/kg)	0.3	<1.00	<1.20	<1.20	<1.20	0.37	0.38
Cadmium (mg/kg)	<0.200	<1.00	<1.20	<1.20	<1.20	0.76	0.34
Calcium (mg/kg)	2230	2900	1900	1800	1600	23700	2090
Chromium (mg/kg)	41.1	23	30	52	35	25.2	49.3
Cobalt (mg/kg)	6.2	<5.20	<6.20	6.3	6.3	6.1	6.8
Copper (mg/kg)	36.4	<5.20	6.9	10	11	61	17.9
Iron (mg/kg)	13400	7060	9340	19500	14600	14300	15500
Lead (mg/kg)	<6.00	<5.20	<6.20	8.8	<6.10	303	<4.00
Magnesium (mg/kg)	3400	2100	2900	3500	3300	4420	2590
Manganese (mg/kg)	170	85	97	160	180	269	148
Molybdenum (mg/kg)	<1.20	<5.20	<6.20	<5.90	<6.10	<0.350	<0.380
Nickel (mg/kg)	44.9	22	31	50	46	19.6	38.3
Potassium (mg/kg)	850	680	1000	1500	1500	1070	992
Silver (mg/kg)	<0.700	<5.20	<6.20	<5.90	<6.10	0.43	<0.430
Sodium (mg/kg)	1020	<520	<620	1300	1200	725	683
Thallium (mg/kg)	<3.10	<10.0	<12.0	<12.0	<12.0	<3.60	<3.70
Titanium (mg/kg)	435	410	440	656	470	307	354
Vanadium (mg/kg)	23.9	16	20	38	27	26	31.9
Zinc (mg/kg)	43.1	14	21	28	27	292	33.8

Notes: NA = Not Analyzed
< = Detection Limit
mg/kg = milligram per kilogram
Data not validated by JMM

TABLE 14-7

SITE 19 - YARD D-13, HAZARDOUS WASTE STORAGE
RESULTS FOR METALS DETECTED IN SOIL SAMPLES
(Sheet 3 of 10)

Parameter Reported	BD13-13 07/11/90 11-11.5 ft	BD13-13 07/11/90 14-14.5 ft	BD13-14 07/09/90 2-2.5 ft	BD13-14 07/09/90 4-4.5 ft	BD13-14 07/09/90 14-14.5 ft	BD13-14 07/09/90 15-15.5 ft	BD13-15 07/10/90 2-2.5 ft
Aluminum (mg/kg)	8570	7920	4910	4590	11600	12000	5500
Arsenic (mg/kg)	3.2	4.5	<10.0	<11.0	<12.0	<12.0	<2.50
Barium (mg/kg)	65.1	74.9	25	<21.0	81	85	37.4
Beryllium (mg/kg)	0.28	0.29	<1.00	<1.10	<1.20	<1.20	<0.200
Cadmium (mg/kg)	0.32	0.4	<1.00	<1.10	<1.20	<1.20	0.4
Calcium (mg/kg)	1860	2060	3600	2000	2100	2400	3310
Chromium (mg/kg)	34.7	38.6	27	26	38	42	33.4
Cobalt (mg/kg)	6	7.2	<5.20	<5.30	6.7	6.7	4.5
Copper (mg/kg)	9.9	13.1	<5.20	<5.30	9.2	11	12.1
Iron (mg/kg)	12100	13100	7910	7370	15100	16800	8440
Lead (mg/kg)	<3.90	<4.00	<5.20	<5.30	<6.00	<6.00	13.7
Magnesium (mg/kg)	3120	3260	2300	2100	3200	3500	2990
Manganese (mg/kg)	150	196	88	84	170	170	128
Molybdenum (mg/kg)	<0.350	<0.460	<5.20	<5.30	<6.00	<6.00	1.6
Nickel (mg/kg)	43.7	47.9	24	23	46	51	29.8
Potassium (mg/kg)	760	914	780	700	1400	1400	760
Silver (mg/kg)	<0.420	<0.430	<5.20	<5.30	<6.00	<6.00	<0.600
Sodium (mg/kg)	495	594	<520	<530	980	1000	362
Thallium (mg/kg)	<3.70	<3.70	<10.0	<11.0	<12.0	<12.0	<2.70
Titanium (mg/kg)	407	372	420	430	548	520	819
Vanadium (mg/kg)	22.7	23.3	19	18	27	30	20.7
Zinc (mg/kg)	32.3	33.4	16	16	27	30	37.5

Notes: NA = Not Analyzed
< = Detection Limit
mg/kg = milligram per kilogram
Data not validated by JMM

TABLE 14-7

SITE 19 - YARD D-13, HAZARDOUS WASTE STORAGE
RESULTS FOR METALS DETECTED IN SOIL SAMPLES
(Sheet 4 of 10)

Parameter Reported	BD13-15 07/10/90 8.5-9 ft	BD13-15 07/10/90 12.5-13 ft	BD13-15 07/10/90 13.5-14 ft	BD13-16 07/10/90 1.5-2 ft	BD13-16 07/10/90 5-5.5 ft	BD13-16 07/10/90 10.5-11 ft	BD13-16 07/10/90 13.5-14 ft
Aluminum (mg/kg)	16400	9530	8670	3980	5020	8470	11600
Arsenic (mg/kg)	7.1	6	4.7	<2.50	3.2	7.4	3.7
Barium (mg/kg)	103	65.5	60.7	25.8	32.5	65.6	112
Beryllium (mg/kg)	0.3	0.3	0.4	<0.200	<0.200	0.4	0.4
Cadmium (mg/kg)	0.3	<0.200	<0.200	0.2	<0.200	0.5	0.4
Calcium (mg/kg)	42300	2270	1950	2370	1920	13200	1890
Chromium (mg/kg)	43.6	38.8	38	30.1	31.1	33	51.8
Cobalt (mg/kg)	8.9	6.3	6.1	3.5	5.4	6.1	7.9
Copper (mg/kg)	256	33.2	25.3	21.6	106	69.8	19.5
Iron (mg/kg)	21700	13100	12500	6680	9020	19500	16900
Lead (mg/kg)	<6.00	<5.80	<5.80	<5.20	<6.00	385	6.2
Magnesium (mg/kg)	10800	2920	2700	2100	2850	3560	4240
Manganese (mg/kg)	516	150	128	85.3	106	217	172
Molybdenum (mg/kg)	1.4	<1.20	<1.20	<1.00	<1.20	<1.20	<1.20
Nickel (mg/kg)	41.4	44.5	41.4	23.6	28.5	39.5	57.4
Potassium (mg/kg)	1400	1200	1000	540	880	1200	1600
Silver (mg/kg)	<0.700	<0.700	<0.700	<0.600	<0.700	<0.700	<0.700
Sodium (mg/kg)	780	1130	1070	153	727	1130	1430
Thallium (mg/kg)	<3.10	<3.00	<3.00	<2.70	<3.10	<3.10	<3.10
Titanium (mg/kg)	846	505	410	328	313	372	540
Vanadium (mg/kg)	31.8	24	22.5	15.6	18	27.1	30.3
Zinc (mg/kg)	199	39.6	41.1	33.4	71.2	126	47.1

Notes: NA = Not Analyzed
< = Detection Limit
mg/kg = milligram per kilogram
Data not validated by JMM

TABLE 14-7

SITE 19 - YARD D-13, HAZARDOUS WASTE STORAGE
RESULTS FOR METALS DETECTED IN SOIL SAMPLES
(Sheet 5 of 10)

Parameter Reported	BD13-5 07/03/90 0.5-1 ft	BD13-5 07/03/90 2.5-3 ft	BD13-5 07/03/90 5.5-6 ft	BD13-5 07/03/90 10-10.5 ft	BD13-6 07/03/90 0.5-1 ft	BD13-6 07/03/90 2.5-3 ft	BD13-6 07/03/90 5.5-6 ft
Aluminum (mg/kg)	5170	5820	5580	15800	5160	6360	6600
Arsenic (mg/kg)	<10.0	<11.0	<12.0	<12.0	<10.0	<11.0	<12.0
Barium (mg/kg)	33	22	33	94	29	32	37
Beryllium (mg/kg)	<1.00	<1.10	<1.20	<1.20	<1.00	<1.10	<1.20
Cadmium (mg/kg)	<1.00	<1.10	<1.20	<1.20	<1.00	<1.10	<1.20
Calcium (mg/kg)	5200	2500	2700	2400	3100	2700	2700
Chromium (mg/kg)	29	35	38	50	30	29	37
Cobalt (mg/kg)	<5.20	<5.60	<6.10	7.8	<5.20	<5.60	<6.10
Copper (mg/kg)	8	11	6.2	14	8.3	11	6.3
Iron (mg/kg)	7850	8640	8950	20500	7560	9040	9670
Lead (mg/kg)	<5.20	6.6	<6.10	<6.20	<5.20	<5.60	<6.10
Magnesium (mg/kg)	2300	2100	2300	4000	2000	2800	2500
Manganese (mg/kg)	98	96	99	220	100	96	110
Molybdenum (mg/kg)	<5.20	<5.60	<6.10	<6.20	<5.20	<5.60	<6.10
Nickel (mg/kg)	25	29	29	62	23	29	31
Potassium (mg/kg)	720	630	670	1500	620	960	820
Silver (mg/kg)	<5.20	<5.60	<6.10	<6.20	<5.20	<5.60	<6.10
Sodium (mg/kg)	<520	<560	<610	900	<520	<560	<610
Thallium (mg/kg)	<10.0	<11.0	<12.0	<12.0	<10.0	<11.0	<12.0
Titanium (mg/kg)	510	400	480	760	535	511	510
Vanadium (mg/kg)	20	21	22	40	21	21	24
Zinc (mg/kg)	18	21	21	35	17	21	27

Notes: NA = Not Analyzed
< = Detection Limit
mg/kg = milligram per kilogram
Data not validated by JMM

TABLE 14-7

SITE 19 - YARD D-13, HAZARDOUS WASTE STORAGE
RESULTS FOR METALS DETECTED IN SOIL SAMPLES
(Sheet 6 of 10)

Parameter Reported	BD13-6 07/03/90 8.5-9 ft	BD13-6 07/03/90 9.5-10 ft	BD13-7 07/03/90 0.5-1 ft	BD13-7 07/03/90 2-2.5 ft	BD13-7 07/03/90 5-5.5 ft	BD13-7 07/03/90 8.5-9 ft	BD13-7R 07/05/90 5.5-6 ft
Aluminum (mg/kg)	14900	19400	5450	10900	5740	11500	7320
Arsenic (mg/kg)	<12.0	<12.0	<10.0	<13.0	<12.0	<12.0	<12.0
Barium (mg/kg)	90	100	30	63	71	54	72
Beryllium (mg/kg)	<1.20	<1.20	<1.00	<1.30	<1.20	<1.20	<1.20
Cadmium (mg/kg)	<1.20	<1.20	<1.00	<1.30	<1.20	<1.20	<1.20
Calcium (mg/kg)	2100	2600	2300	4200	1600	2100	2000
Chromium (mg/kg)	45	64	28	67	27	50	37
Cobalt (mg/kg)	9.8	7	<5.30	8.9	<5.90	8	<5.80
Copper (mg/kg)	13	16	9	110	9.5	9	8
Iron (mg/kg)	22400	22100	8000	32300	9180	15100	9570
Lead (mg/kg)	<6.00	<6.00	<5.30	13	<5.90	<6.00	<5.80
Magnesium (mg/kg)	3800	4100	2200	4000	1600	3100	1800
Manganese (mg/kg)	290	230	95	200	150	200	180
Molybdenum (mg/kg)	<6.00	<6.00	<5.30	<6.40	<5.90	<6.00	<5.80
Nickel (mg/kg)	53	58	26	64	20	41	22
Potassium (mg/kg)	820	1100	810	1400	810	930	830
Silver (mg/kg)	<6.00	<6.00	<5.30	<6.40	<5.90	<6.00	<5.80
Sodium (mg/kg)	<600	620	<530	<640	<590	740	<580
Thallium (mg/kg)	<12.0	<12.0	<10.0	<13.0	<12.0	<12.0	<12.0
Titanium (mg/kg)	550	672	470	781	400	534	470
Vanadium (mg/kg)	41	48	19	34	21	34	24
Zinc (mg/kg)	31	32	21	61	18	24	18

Notes: NA = Not Analyzed
< = Detection Limit
mg/kg = milligram per kilogram
Data not validated by JMM

TABLE 14-7

SITE 19 - YARD D-13, HAZARDOUS WASTE STORAGE
RESULTS FOR METALS DETECTED IN SOIL SAMPLES
(Sheet 7 of 10)

Parameter Reported	BD13-8 07/05/90 0.5-1 ft	BD13-8 07/05/90 3-3.5 ft	BD13-8 07/05/90 11-11.5 ft	BD13-8 07/05/90 13-13.5 ft	BD13-8R 07/05/90 3.5-4 ft	BD13-9 07/05/90 0.5-1 ft	BD13-9 07/05/90 3.5-4 ft
Aluminum (mg/kg)	4980	2840	8440	12300	4700	3540	3940
Arsenic (mg/kg)	<10.0	<11.0	<12.0	14	<12.0	<10.0	<12.0
Barium (mg/kg)	31	31	74	79	39	27	26
Beryllium (mg/kg)	<1.00	<1.10	<1.20	<1.20	<1.20	<1.00	<1.20
Cadmium (mg/kg)	<1.00	<1.10	<1.20	<1.20	<1.20	<1.00	<1.20
Calcium (mg/kg)	2800	1400	1200	2300	2100	2100	1500
Chromium (mg/kg)	21	20	31	41	31	22	27
Cobalt (mg/kg)	<5.20	<5.40	6.6	6.9	<5.90	<5.30	<5.80
Copper (mg/kg)	120	18	11	11	13	10	13
Iron (mg/kg)	8500	4670	140	15300	7920	6230	8150
Lead (mg/kg)	<5.20	<5.40	<5.90	6.9	7.2	<5.30	6.9
Magnesium (mg/kg)	4100	1200	3200	3100	1700	2000	2300
Manganese (mg/kg)	140	110	190	200	90	82	100
Molybdenum (mg/kg)	<5.20	<5.40	<5.90	<6.00	<5.90	<5.30	<5.80
Nickel (mg/kg)	30	19	48	49	25	23	29
Potassium (mg/kg)	620	<540	1100	1200	<590	540	640
Silver (mg/kg)	<5.20	<5.40	<5.90	<6.00	<5.90	<5.30	<5.80
Sodium (mg/kg)	<520	<540	1000	1000	<590	<530	<580
Thallium (mg/kg)	<10.0	<11.0	<12.0	<12.0	<12.0	<10.0	<12.0
Titanium (mg/kg)	270	220	370	594	350	280	270
Vanadium (mg/kg)	17	12	25	30	19	14	18
Zinc (mg/kg)	71	23	27	28	22	17	21

Notes: NA = Not Analyzed
< = Detection Limit
mg/kg = milligram per kilogram
Data not validated by JMM

Parameter Reported	BD13-9 07/05/90 8-8.5 ft	BD13-9 07/05/90 14.5-15 ft	BD13-9R 07/05/90 4-4.5 ft	MWD13-1 07/11/90 0.5-1 ft	MWD13-1 07/11/90 7-7.5 ft	MWD13-1 07/11/90 10-10.5 ft	MWD13-1 07/11/90 13-13.5 ft
Aluminum (mg/kg)	2740	7230	2750	3890	5480	11700	13400
Arsenic (mg/kg)	<12.0	<12.0	2.9	3.1	2.7	3	5.1
Barium (mg/kg)	190	58	14	<22.3	35.8	61.5	110
Beryllium (mg/kg)	<1.20	<1.20	<0.200	<0.130	0.21	0.37	0.38
Cadmium (mg/kg)	<1.20	<1.20	<0.200	0.26	0.31	0.48	0.42
Calcium (mg/kg)	99800	1900	1870	6640	1460	1600	2870
Chromium (mg/kg)	15	35	20.4	25	<30.7	39.5	54.9
Cobalt (mg/kg)	<6.20	<6.10	3.5	<4.20	5.8	8	9.7
Copper (mg/kg)	32	9.6	21	18.2	6.7	13.3	15.6
Iron (mg/kg)	6150	12400	4740	6430	7120	14700	18300
Lead (mg/kg)	27	<6.10	<5.30	<3.50	<3.50	<3.50	<4.10
Magnesium (mg/kg)	4100	2900	1440	2250	1590	3070	4960
Manganese (mg/kg)	360	140	100	92.4	148	154	268
Molybdenum (mg/kg)	<6.20	<6.10	<1.10	<0.310	<0.540	<0.540	<0.630
Nickel (mg/kg)	9.9	39	18.4	23.8	<18.3	42.2	66.9
Potassium (mg/kg)	<620	760	990	590	607	487	1110
Silver (mg/kg)	<6.20	<6.10	<0.600	<0.380	<0.250	<0.250	0.32
Sodium (mg/kg)	<620	<610	306	239	228	728	678
Thallium (mg/kg)	<12.0	<12.0	<2.70	3.3	<1.40	<1.40	<1.60
Titanium (mg/kg)	150	450	184	312	330	478	639
Vanadium (mg/kg)	12	23	10.6	15	21.6	28.7	33.8
Zinc (mg/kg)	46	26	26.8	28.5	23.3	32.1	44.2

Notes: NA = Not Analyzed
< = Detection Limit
Data not validated by JMM

TABLE 14-7
SITE 19 – RESULTS FOR METALS DETECTED IN SOIL SAMPLES
PAGES 9 THROUGH 10

FINAL DATA SUMMARY REPORT RI/FS
PHASE 1 AND 2A, VOLUME I

THE ABOVE IDENTIFIED PAGES
ARE NOT AVAILABLE.

EXTENSIVE RESEARCH WAS PERFORMED BY SOUTHWEST DIVISION TO LOCATE THESE PAGES. THIS PAGE HAS BEEN INSERTED AS A PLACEHOLDER AND WILL BE REPLACED SHOULD THE MISSING ITEM BE LOCATED.

QUESTIONS MAY BE DIRECTED TO:

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RECORDS MANAGEMENT SPECIALIST
SOUTHWEST
NAVAL FACILITIES ENGINEERING COMMAND
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TABLE 14-8

SITE 19 - YARD D-13, HAZARDOUS WASTE STORAGE
RESULTS FOR pH AND CATIONS/ANIONS DETECTED IN SOIL SAMPLES
(Sheet 1 of 2)

Parameter Reported	BD13-10 07/05/90 0.5-1 ft	BD13-11 07/10/90 4-4.5 ft	BD13-12 07/09/90 4.5-5 ft	BD13-13 07/11/90 8-8.5 ft	BD13-14 07/09/90 4-4.5 ft	BD13-15 07/10/90 8.5-9 ft	BD13-16 07/10/90 5-5.5 ft
Characteristic Measurements							
pH (Units)	8.5	9.44	8.6	9.1	8.7	11.9	9.9

Parameter Reported	BD13-10 07/05/90 1.5-2 ft	BD13-11 07/10/90 1.5-2 ft	BD13-12 07/09/90 3-3.5 ft	BD13-5 07/03/90 1-1.5 ft	BD13-6 07/03/90 1-1.5 ft	BD13-7 07/03/90 1-1.5 ft	BD13-8 07/05/90 1-1.5 ft
Cations/Anions							
Cation Exchange Capacity (meq/hg)	3.76	9.44	3.36	2.56	2.96	2.88	3.68

Notes: NA = Not Analyzed
< = Detection Limit
Data not validated by JMM

TABLE 14-8

SITE 19 - YARD D-13, HAZARDOUS WASTE STORAGE
RESULTS FOR pH AND CATIONS/ANIONS DETECTED IN SOIL SAMPLES
(Sheet 2 of 2)

Parameter Reported	BD13-5 07/03/90 2.5-3 ft	BD13-6 07/03/90 2.5-3 ft	BD13-7 07/03/90 2-2.5 ft	BD13-8 07/05/90 3-3.5 ft	BD13-8R 07/05/90 3.5-4 ft	BD13-9 07/05/90 3.5-4 ft	MWD13-1 07/11/90 7-7.5 ft
Characteristic Measurements							
pH (Units)	8.9	8.4	7.4	9	8.6	8.7	9.4

Parameter Reported	BD13-9 07/05/90 1-1.5 ft	MWD13-1 07/11/90 1-1.5 ft	MWD13-2 07/27/90 3.5-4 ft	MWD13-3 07/27/90 2-2.5 ft	MWD13-4 07/09/90 3-3.5 ft
Cations/Anions					
Cation Exchange Capacity (meq/hg)	3.52	3.28	3.2	3.28	3.36

Parameter Reported	MWD13-2 07/06/90 1.5-2 ft	MWD13-3 07/27/90 2-2.5 ft	MWD13-4 07/09/90 4.5-5 ft
Characteristic Measurements			
pH (Units)	8.6	8.7	9.3

Notes: NA = Not Analyzed
< = Detection Limit
Data not validated by JMM

TABLE 14-9

SITE 19 - YARD D-13, HAZARDOUS WASTE STORAGE
RESULTS FOR GENERAL CHEMICAL CHARACTERISTICS IN SOIL SAMPLES
(Sheet 1 of 2)

Parameter Reported	BD13-10 07/05/90 1.5-2 ft	BD13-11 07/10/90 1.5-2 ft	BD13-12 07/09/90 3-3.5 ft	BD13-13 07/11/90 2.5-3 ft	BD13-14 07/09/90 2.5-3 ft	BD13-15 07/10/90 2-2.5 ft	BD13-15 07/10/90 2.5-3 ft
Ash (%)	98.7	98.7	99	99	99.2	NA	99.2
Chloride (mg/kg)	NA	NA	13	8.5	11.8	11.8	NA
Sulfate (mg/kg)	NA	NA	NA	NA	NA	NA	NA
Total Kjeldahl Nitrogen (mg/kg)	NA	NA	NA	NA	NA	NA	NA
Total Phosphorus (mg/kg)	NA	NA	NA	NA	NA	NA	NA
Cyanide (mg/kg)	NA	NA	NA	NA	NA	<0.510	NA

Parameter Reported	BD13-15 07/10/90 12.5-13 ft	BD13-15 07/10/90 13.5-14 ft	BD13-16 07/10/90 2-2.5 ft	BD13-5 07/03/90 1-1.5 ft	BD13-6 07/03/90 1-1.5 ft	BD13-7 07/03/90 1-1.5 ft	BD13-8 07/05/90 1-1.5 ft
Ash (%)	NA	NA	99.3	99.2	99.3	99.2	99.2
Chloride (mg/kg)	NA	NA	NA	18.6	7.1	8.5	10
Sulfate (mg/kg)	NA	NA	NA	13.9	NA	NA	NA
Total Kjeldahl Nitrogen (mg/kg)	NA	NA	NA	95.2	NA	NA	NA
Total Phosphorus (mg/kg)	NA	NA	NA	238	NA	NA	NA
Cyanide (mg/kg)	0.68	0.79	NA	NA	NA	NA	NA

Notes: NA = Not Analyzed
< = Detection Limit
mg/kg = milligrams per kilogram
Data not validated by JMM

TABLE 14-9

SITE 19 - YARD D-13, HAZARDOUS WASTE STORAGE
RESULTS FOR GENERAL CHEMICAL CHARACTERISTICS IN SOIL SAMPLES
(Sheet 2 of 2)

Parameter Reported	BD13-9 07/05/90 0.5-1 ft	BD13-9 07/05/90 1-1.5 ft	MWD13-1 07/11/90 0.5-1 ft	MWD13-1 07/11/90 1-1.5 ft	MWD13-1 07/11/90 7-7.5 ft	MWD13-2 07/27/90 3.5-4 ft	MWD13-2 07/06/90 9-9.5 ft
Ash (%)	NA	99.2	NA	99.2	NA	99.1	NA
Chloride (mg/kg)	16	NA	NA	6.2	NA	NA	NA
Sulfate (mg/kg)	NA	NA	NA	NA	NA	NA	NA
Total Kjeldahl Nitrogen (mg/kg)	NA	NA	NA	NA	NA	NA	NA
Total Phosphorus (mg/kg)	NA	NA	NA	NA	NA	NA	NA
Cyanide (mg/kg)	NA	NA	0.59	NA	0.64	NA	1.6

Parameter Reported	MWD13-3 07/27/90 2-2.5 ft	MWD13-4 07/09/90 3-3.5 ft
Ash (%)	99.3	99.2
Chloride (mg/kg)	NA	7.1
Sulfate (mg/kg)	NA	NA
Total Kjeldahl Nitrogen (mg/kg)	NA	NA
Total Phosphorus (mg/kg)	NA	NA
Cyanide (mg/kg)	NA	NA

Notes: NA = Not Analyzed
< = Detection Limit
mg/kg = nulligrams per kilogram
Data not validated by JMM

TABLE 14-10

SITE 19 - YARD D-13, HAZARDOUS WASTE STORAGE
RESULTS FOR VOLATILE ORGANIC, PESTICIDE, AND HYDROCARBON
COMPOUNDS AND TOTAL ORGANIC CARBON DETECTED IN GROUNDWATER SAMPLES

Parameter Reported	205 08/10/90 0-0 ft	MWD13-1 10/18/90 0-0 ft	MWD13-2 08/09/90 0-0 ft	MWD13-3 10/18/90 0-0 ft	MWD13-4 10/17/90 0-0 ft
Volatile Organic Compounds					
Methylene Chloride (ug/L)	13	9	11	12	12
1,1-Dichloroethane (ug/L)	<5.00	12	<5.00	6	10
1,2-Dichloroethene (total) (ug/L)	<5.00	7	<5.00	<5.00	<5.00

	MWD13-1 10/18/90 0-0 ft	MWD13-2 08/09/90 0-0 ft
Total Organic Carbon		
Total Organic Carbon (mg/L)	27	7.1
Pesticide Compounds		
4,4'-DDT (ug/L)	0.044	NA
Hydrocarbon Compounds		
Oil & Grease (mg/L)	NA	5
TRPH (mg/L)	NA	0.38

Notes: NA = Not Analyzed
< = Detection Limit
mg/L = milligrams per liter
ug/L = micrograms per liter
Data not validated by JMM
200-series numbers as well or boring name indicates a travel blank

TABLE 14-11

SITE 19 - YARD D-13, HAZARDOUS WASTE STORAGE
RESULTS FOR METALS DETECTED IN GROUNDWATER SAMPLES

Parameter Reported	MWD13-1 10/18/90 0-0 ft	MWD13-2 08/09/90 0-0 ft	MWD13-3 10/18/90 0-0 ft	MWD13-4 10/17/90 0-0 ft
Aluminum (mg/L)	187	15	144	378
Arsenic (mg/L)	0.059	<0.050	<0.050	<0.100
Barium (mg/L)	1.3	<0.200	0.83	2.9
Beryllium (mg/L)	<0.005	<0.005	<0.005	0.009
Cadmium (mg/L)	<0.005	<0.005	<0.005	0.0063
Calcium (mg/L)	58	55	95	645
Chromium (mg/L)	0.52	0.047	0.42	1
Cobalt (mg/L)	0.1	<0.050	0.084	0.22
Copper (mg/L)	0.16	<0.025	0.2	0.55
Iron (mg/L)	219	21	189	494
Lead (mg/L)	0.058	<0.050	0.21	0.56
Magnesium (mg/L)	92	23	70	274
Manganese (mg/L)	5.6	0.55	2.8	9.4
Nickel (mg/L)	0.6	0.19	0.51	1.2
Potassium (mg/L)	34	22	28	53
Selenium (mg/L)	0.1	<0.050	0.098	0.15
Sodium (mg/L)	325	51	108	200
Titanium (mg/L)	5.3	0.51	4	9.1
Vanadium (mg/L)	0.46	<0.050	0.34	0.93
Zinc (mg/L)	0.41	0.097	0.51	1.7

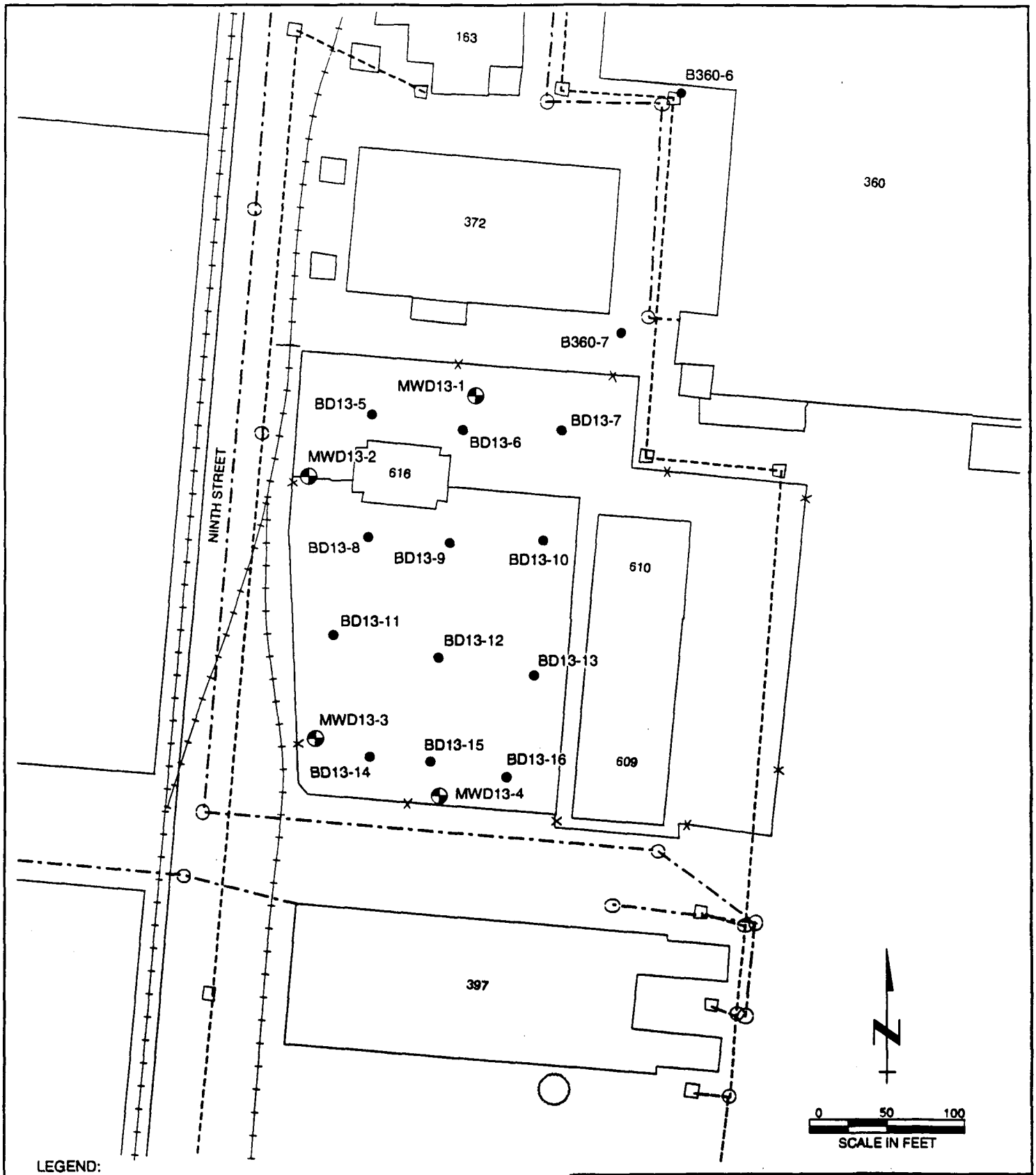
Notes: NA = Not Analyzed
< = Detection Limit
mg/L = milligrams per liter
Data not validated by JMM

TABLE 14-12

SITE 19 - YARD D-13, HAZARDOUS WASTE STORAGE
RESULTS FOR GENERAL CHEMICAL CHARACTERISTICS IN GROUNDWATER SAMPLES

Parameter Reported	MWD13-1 10/18/90 0-0 ft	MWD13-2 08/09/90 0-0 ft	MWD13-3 10/18/90 0-0 ft	MWD13-4 10/17/90 0-0 ft
Miscellaneous Measurements				
Alkalinity, bicarb (as CaCO3) (mg/L)	870	280	140	<5.00
Alkalinity, carb (as CaCO3) (mg/L)	<5.00	<5.00	80	360
Alkalinity, total (as CaCO3) (mg/L)	<5.00	<5.00	<5.00	98
Chloride (mg/L)	870	280	220	450
Sulfate (mg/L)	52	33	68	129
Total Dissolved Solids (mg/L)	113	14	129	101
Total Hardness (as CaCO3) (mg/L)	1360	440	480	770
Total Cyanide (mg/L)	524	232	526	2740
Characteristic Measurements				
Dissolved Oxygen (mg/L)	5.8	6.2	2.3	5.8
pH (Units)	7.3	7.7	9.7	12
Specific Conductivity (umhos/CM)	1590	570	620	1410

Notes: NA = Not Analyzed
< = Detection Limit
mg/L = milligrams per liter
Data not validated by JMM



LEGEND:

- Canonie Boring Location
- Canonie Monitoring Well Location
- Fence
- Sanitary Sewer Line
- Storm Sewer Line
- Railroad
- Manhole
- Catch Basin

NOTE:
Boring and monitoring well locations were obtained from a base map provided by Canonie Environmental, Inc. The individual locations were digitized onto a base map CAD file provided by NAS Alameda.

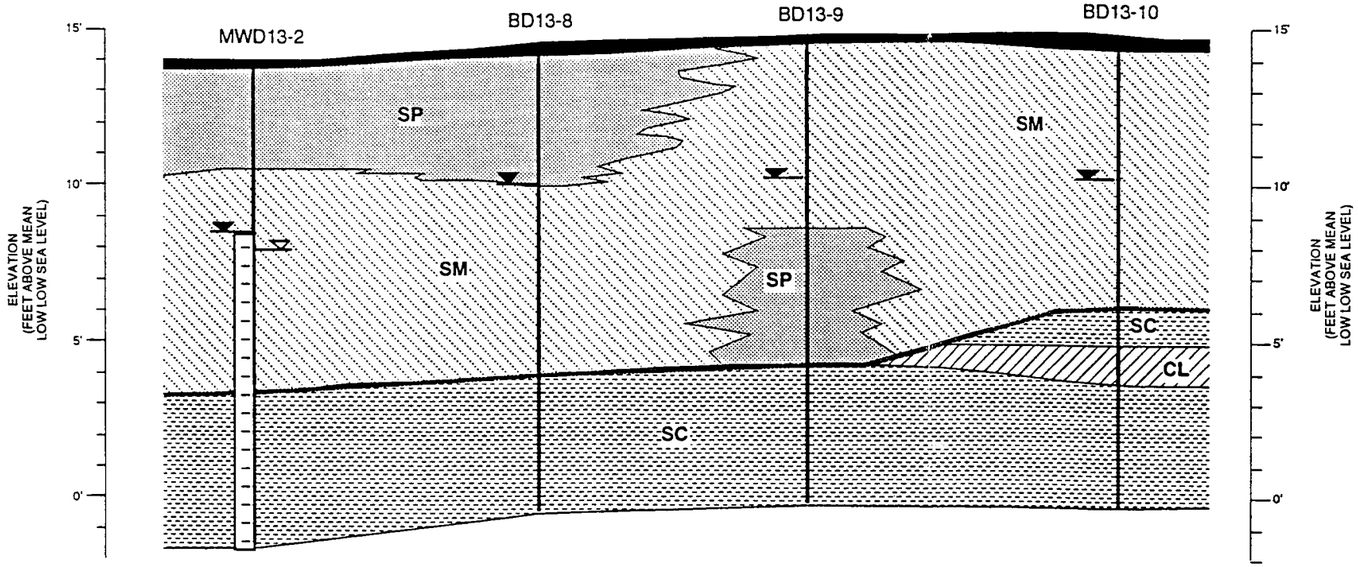
A-22

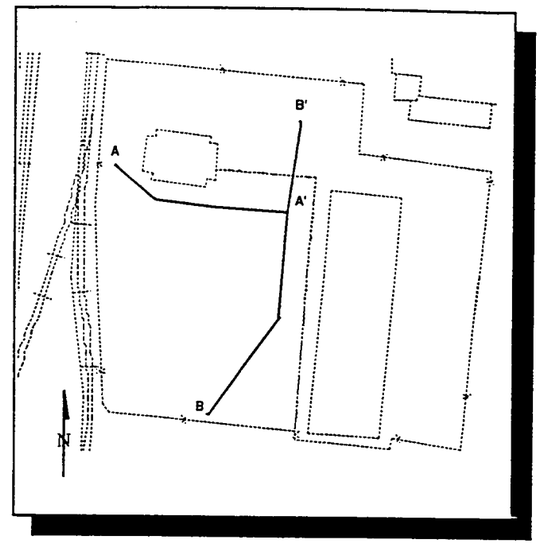
NAVAL AIR STATION ALAMEDA
ALAMEDA, CALIFORNIA
SITE 19 - YARD D-13,
HAZARDOUS WASTE STORAGE
CANONIE BORING AND MONITORING WELL LOCATIONS

FIGURE 14-1

A
WEST

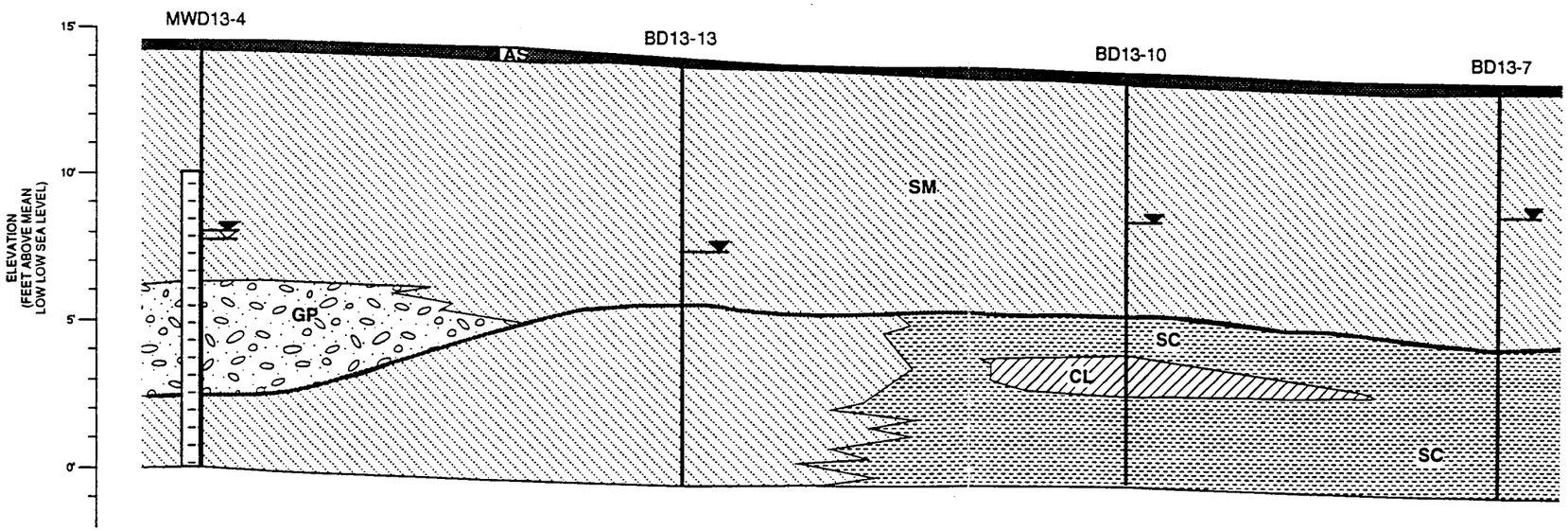
A'
EAST

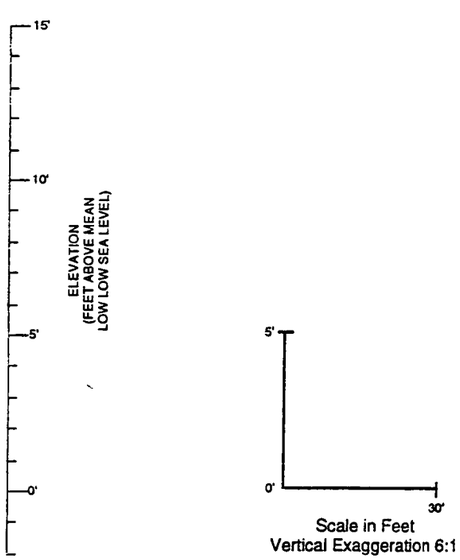




B
SOUTH

B'
NORTH





Scale in Feet
Vertical Exaggeration 6:1

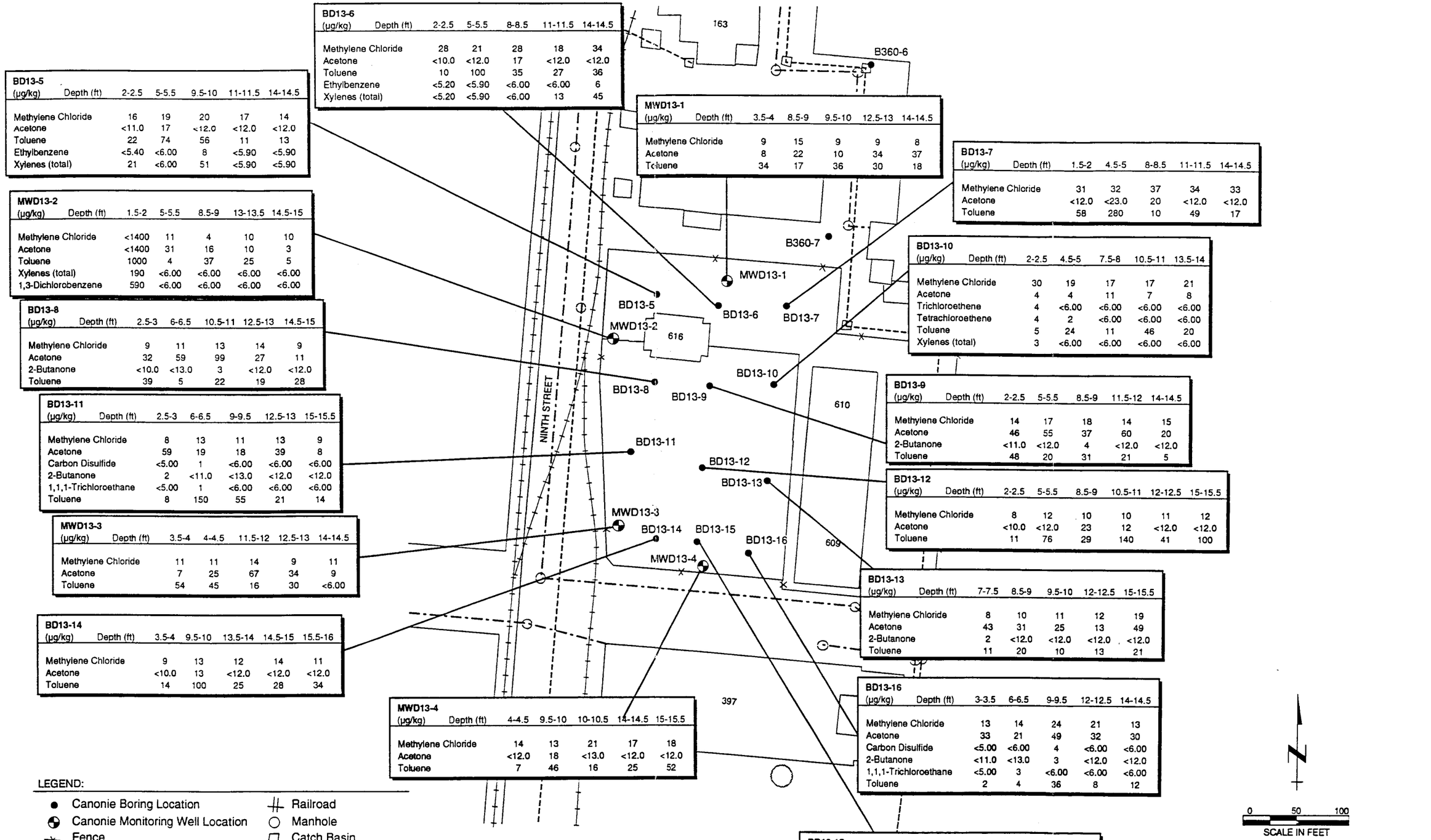
LEGEND:

- GP Gravelly Sand
- SP Sand
- SM Silty Sand
- SC Clayey Sand
- CL Clay
- AS Asphalt
- Approximate Fill/Native Sediment Interface
- Water Level During Water Sampling
- First Water During Drilling
- Monitoring Well
- Screened Interval

This cross section is based on logs of wells and borings drilled and logged by Canonie Environmental, Inc. All water levels were measured by Canonie Environmental, Inc.

NAVAL AIR STATION ALAMEDA
ALAMEDA, CALIFORNIA
SITE 19 - YARD D-13,
HAZARDOUS WASTE STORAGE
GEOLOGIC CROSS SECTION A-A', B-B'

FIGURE 14-2



BD13-6

(µg/kg) Depth (ft)	2-2.5	5-5.5	8-8.5	11-11.5	14-14.5
Methylene Chloride	28	21	28	18	34
Acetone	<10.0	<12.0	17	<12.0	<12.0
Toluene	10	100	35	27	36
Ethylbenzene	<5.20	<5.90	<6.00	<6.00	6
Xylenes (total)	<5.20	<5.90	<6.00	13	45

BD13-5

(µg/kg) Depth (ft)	2-2.5	5-5.5	9.5-10	11-11.5	14-14.5
Methylene Chloride	16	19	20	17	14
Acetone	<11.0	17	<12.0	<12.0	<12.0
Toluene	22	74	56	11	13
Ethylbenzene	<5.40	<6.00	8	<5.90	<5.90
Xylenes (total)	21	<6.00	51	<5.90	<5.90

MWD13-1

(µg/kg) Depth (ft)	3.5-4	8.5-9	9.5-10	12.5-13	14-14.5
Methylene Chloride	9	15	9	9	8
Acetone	8	22	10	34	37
Toluene	34	17	36	30	18

BD13-7

(µg/kg) Depth (ft)	1.5-2	4.5-5	8-8.5	11-11.5	14-14.5
Methylene Chloride	31	32	37	34	33
Acetone	<12.0	<23.0	20	<12.0	<12.0
Toluene	58	280	10	49	17

MWD13-2

(µg/kg) Depth (ft)	1.5-2	5-5.5	8.5-9	13-13.5	14.5-15
Methylene Chloride	<1400	11	4	10	10
Acetone	<1400	31	16	10	3
Toluene	1000	4	37	25	5
Xylenes (total)	190	<6.00	<6.00	<6.00	<6.00
1,3-Dichlorobenzene	590	<6.00	<6.00	<6.00	<6.00

BD13-10

(µg/kg) Depth (ft)	2-2.5	4.5-5	7.5-8	10.5-11	13.5-14
Methylene Chloride	30	19	17	17	21
Acetone	4	4	11	7	8
Trichloroethene	4	<6.00	<6.00	<6.00	<6.00
Tetrachloroethene	4	2	<6.00	<6.00	<6.00
Toluene	5	24	11	46	20
Xylenes (total)	3	<6.00	<6.00	<6.00	<6.00

BD13-8

(µg/kg) Depth (ft)	2.5-3	6-6.5	10.5-11	12.5-13	14.5-15
Methylene Chloride	9	11	13	14	9
Acetone	32	59	99	27	11
2-Butanone	<10.0	<13.0	3	<12.0	<12.0
Toluene	39	5	22	19	28

BD13-9

(µg/kg) Depth (ft)	2-2.5	5-5.5	8.5-9	11.5-12	14-14.5
Methylene Chloride	14	17	18	14	15
Acetone	46	55	37	60	20
2-Butanone	<11.0	<12.0	4	<12.0	<12.0
Toluene	48	20	31	21	5

BD13-11

(µg/kg) Depth (ft)	2.5-3	6-6.5	9-9.5	12.5-13	15-15.5
Methylene Chloride	8	13	11	13	9
Acetone	59	19	18	39	8
Carbon Disulfide	<5.00	1	<6.00	<6.00	<6.00
2-Butanone	2	<11.0	<13.0	<12.0	<12.0
1,1,1-Trichloroethane	<5.00	1	<6.00	<6.00	<6.00
Toluene	8	150	55	21	14

BD13-12

(µg/kg) Depth (ft)	2-2.5	5-5.5	8.5-9	10.5-11	12-12.5	15-15.5
Methylene Chloride	8	12	10	10	11	12
Acetone	<10.0	<12.0	23	12	<12.0	<12.0
Toluene	11	76	29	140	41	100

MWD13-3

(µg/kg) Depth (ft)	3.5-4	4-4.5	11.5-12	12.5-13	14-14.5
Methylene Chloride	11	11	14	9	11
Acetone	7	25	67	34	9
Toluene	54	45	16	30	<6.00

BD13-13

(µg/kg) Depth (ft)	7-7.5	8.5-9	9.5-10	12-12.5	15-15.5
Methylene Chloride	8	10	11	12	19
Acetone	43	31	25	13	49
2-Butanone	2	<12.0	<12.0	<12.0	<12.0
Toluene	11	20	10	13	21

BD13-14

(µg/kg) Depth (ft)	3.5-4	9.5-10	13.5-14	14.5-15	15.5-16
Methylene Chloride	9	13	12	14	11
Acetone	<10.0	13	<12.0	<12.0	<12.0
Toluene	14	100	25	28	34

BD13-16

(µg/kg) Depth (ft)	3-3.5	6-6.5	9-9.5	12-12.5	14-14.5
Methylene Chloride	13	14	24	21	13
Acetone	33	21	49	32	30
Carbon Disulfide	<5.00	<6.00	4	<6.00	<6.00
2-Butanone	<11.0	<13.0	3	<12.0	<12.0
1,1,1-Trichloroethane	<5.00	3	<6.00	<6.00	<6.00
Toluene	2	4	36	8	12

MWD13-4

(µg/kg) Depth (ft)	4-4.5	9.5-10	10-10.5	14-14.5	15-15.5
Methylene Chloride	14	13	21	17	18
Acetone	<12.0	18	<13.0	<12.0	<12.0
Toluene	7	46	16	25	52

BD13-15

(µg/kg) Depth (ft)	4-4.5	10.5-11	11.5-12	13-13.5	14.5-15
Methylene Chloride	13	14	12	14	16
Acetone	11	14	6	5	7
1,1-Dichloroethane	<6.00	1	<6.00	<6.00	<6.00
Toluene	160	23	24	16	22

LEGEND:

- Canonie Boring Location
- Canonie Monitoring Well Location
- Fence
- Sanitary Sewer Line
- Storm Sewer Line
- Railroad
- Manhole
- Catch Basin

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0 50 100
SCALE IN FEET

NAVAL AIR STATION ALAMEDA
ALAMEDA, CALIFORNIA
SITE 19 - YARD D-13,
HAZARDOUS WASTE STORAGE
VOLATILE ORGANIC COMPOUNDS IN SOIL

FIGURE 14-3

BD13-5

(µg/kg) Depth (ft)	2-2.5	5.5-6	10-10.5
Di-n-butylphthalate	1500	430	630

MWD13-2

(µg/kg) Depth (ft)	0.5-1	1.5-2	8.5-9	13-13.5
Diethylphthalate	12000	6200	<400	<390
n-Nitroso-di-phenylamine	87	78	45	43
Pentachlorophenol	550	640	<1900	<1900
bis(2-Ethylhexyl)phthalate	750	890	<400	<390

MWD13-1

(µg/kg) Depth (ft)	7-7.5	10-10.5	13-13.5
n-Nitroso-di-phenylamine	48	<390	63
bis(2-Ethylhexyl)phthalate	<370	49	46

BD13-6

(µg/kg) Depth (ft)	0.5-1	2-2.5	5-5.5	8-8.5
Di-n-butylphthalate	3700	570	5200	720

BD13-7

(µg/kg) Depth (ft)	0.5-1	1.5-2	4.5-5	8-8.5
Di-n-butylphthalate	1400	7300	450	430

BD13-8

(µg/kg) Depth (ft)	0.5-1	2.5-3	10.5-11	12.5-13
Naphthalene	40	<340	<410	45
Pyrene	<340	<340	100	<390
Benzo(a)anthracene	<340	<340	72	<390
Chrysene	<340	<340	150	<390
bis(2-Ethylhexyl)phthalate	140	53	<410	69

BD13-9

(µg/kg) Depth (ft)	5-5.5	8.5-9	14-14.5	BD13-9R 4-4.5
Naphthalene	41	<770	<390	<370
Diethylphthalate	<400	8800	<390	<370
n-Nitroso-di-phenylamine	<400	<770	<390	43
Phenanthrene	<400	330	<390	<370
Anthracene	<400	95	<390	<370
Fluoranthene	58	1000	<390	<370
Pyrene	380	1700	<390	<370
Benzo(a)anthracene	<400	540	<390	<370
Chrysene	<400	640	<390	<370
bis(2-Ethylhexyl)phthalate	71	250	44	64
Benzo(b)fluoranthene	<400	920	<390	<370
Benzo(a)pyrene	<400	600	<390	<370
Indeno(1,2,3-cd)pyrene	<400	400	<390	<370
Benzo(g,h,i)perylene	<400	390	<390	<370

BD13-10

(µg/kg) Depth (ft)	2-2.5	7.5-8	13.5-14
Naphthalene	56	<390	<390
bis(2-Ethylhexyl)phthalate	110	100	190

BD13-11

(µg/kg) Depth (ft)	1-1.5	4-4.5	11.5-12	13-13.5
n-Nitroso-di-phenylamine	79	98	<380	95
Pentachlorophenol	410	<3600	<1900	<3900
Fluoranthene	<700	<750	<380	120
Pyrene	<700	<750	<380	140
bis(2-Ethylhexyl)phthalate	550	110	57	150
Benzo(b)fluoranthene	<700	<750	<380	83

BD13-13

(µg/kg) Depth (ft)	2-2.5	8-8.5	11-11.5	14-14.5	14.5-15
n-Nitroso-di-phenylamine	110	<390	49	61	48
Fluoranthene	79	<390	<380	<390	<380
Pyrene	97	<390	<380	<390	<380
bis(2-Ethylhexyl)phthalate	160	70	<380	58	69
Benzo(b)fluoranthene	120	<390	<380	<390	<380

MWD13-3

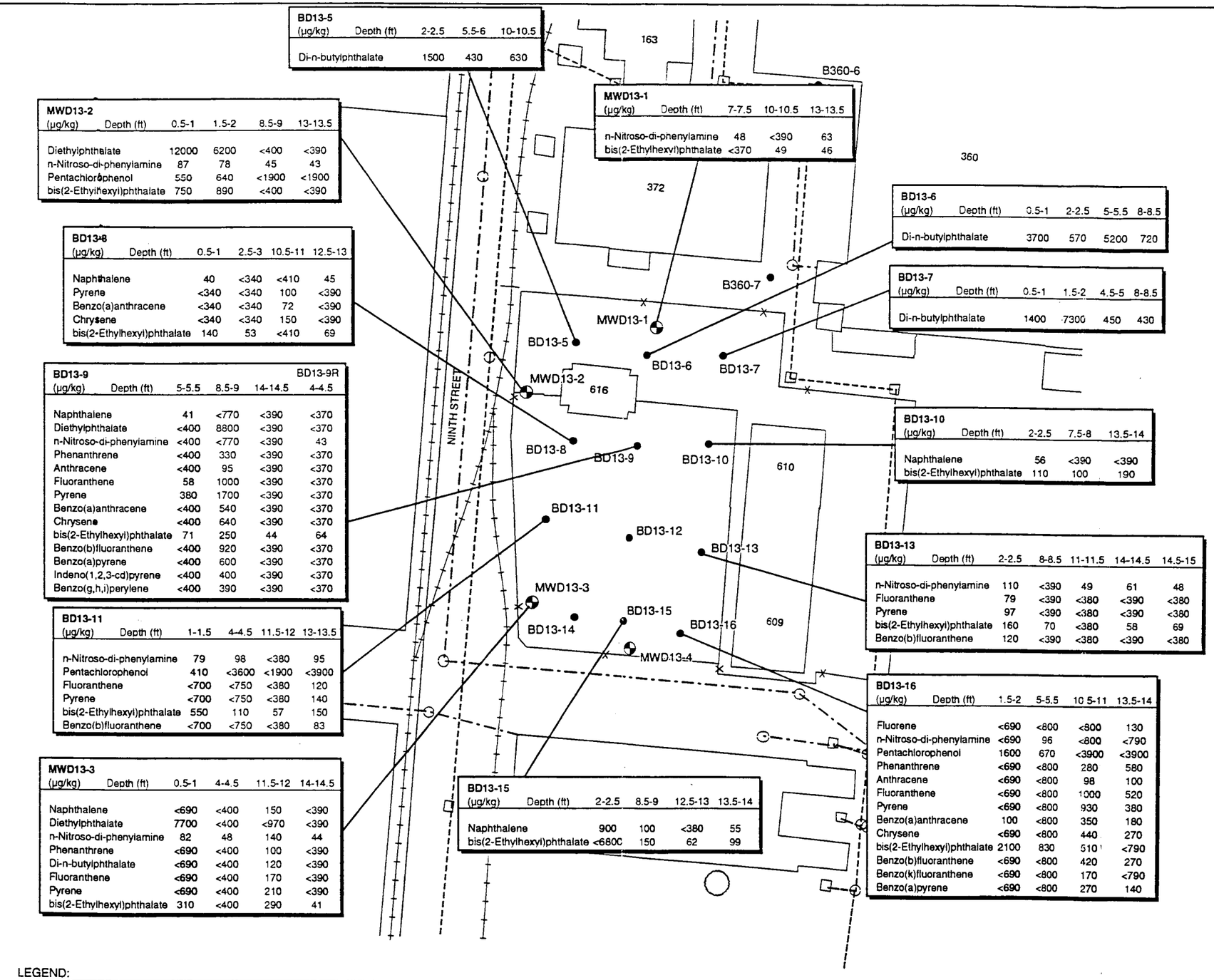
(µg/kg) Depth (ft)	0.5-1	4-4.5	11.5-12	14-14.5
Naphthalene	<690	<400	150	<390
Diethylphthalate	7700	<400	<970	<390
n-Nitroso-di-phenylamine	82	48	140	44
Phenanthrene	<690	<400	100	<390
Di-n-butylphthalate	<690	<400	120	<390
Fluoranthene	<690	<400	170	<390
Pyrene	<690	<400	210	<390
bis(2-Ethylhexyl)phthalate	310	<400	290	41

BD13-15

(µg/kg) Depth (ft)	2-2.5	8.5-9	12.5-13	13.5-14
Naphthalene	900	100	<380	55
bis(2-Ethylhexyl)phthalate	<6800	150	62	99

BD13-16

(µg/kg) Depth (ft)	1.5-2	5-5.5	10.5-11	13.5-14
Fluorene	<690	<800	<800	130
n-Nitroso-di-phenylamine	<690	96	<800	<790
Pentachlorophenol	1600	670	<3900	<3900
Phenanthrene	<690	<800	280	580
Anthracene	<690	<800	98	100
Fluoranthene	<690	<800	1000	520
Pyrene	<690	<800	930	380
Benzo(a)anthracene	100	<800	350	180
Chrysene	<690	<800	440	270
bis(2-Ethylhexyl)phthalate	2100	830	510	<790
Benzo(b)fluoranthene	<690	<800	420	270
Benzo(k)fluoranthene	<690	<800	170	<790
Benzo(a)pyrene	<690	<800	270	140



LEGEND:

- Canonie Boring Location
- Canonie Monitoring Well Location
- Fence
- Sanitary Sewer Line
- Storm Sewer Line
- Railroad
- Manhole
- Catch Basin

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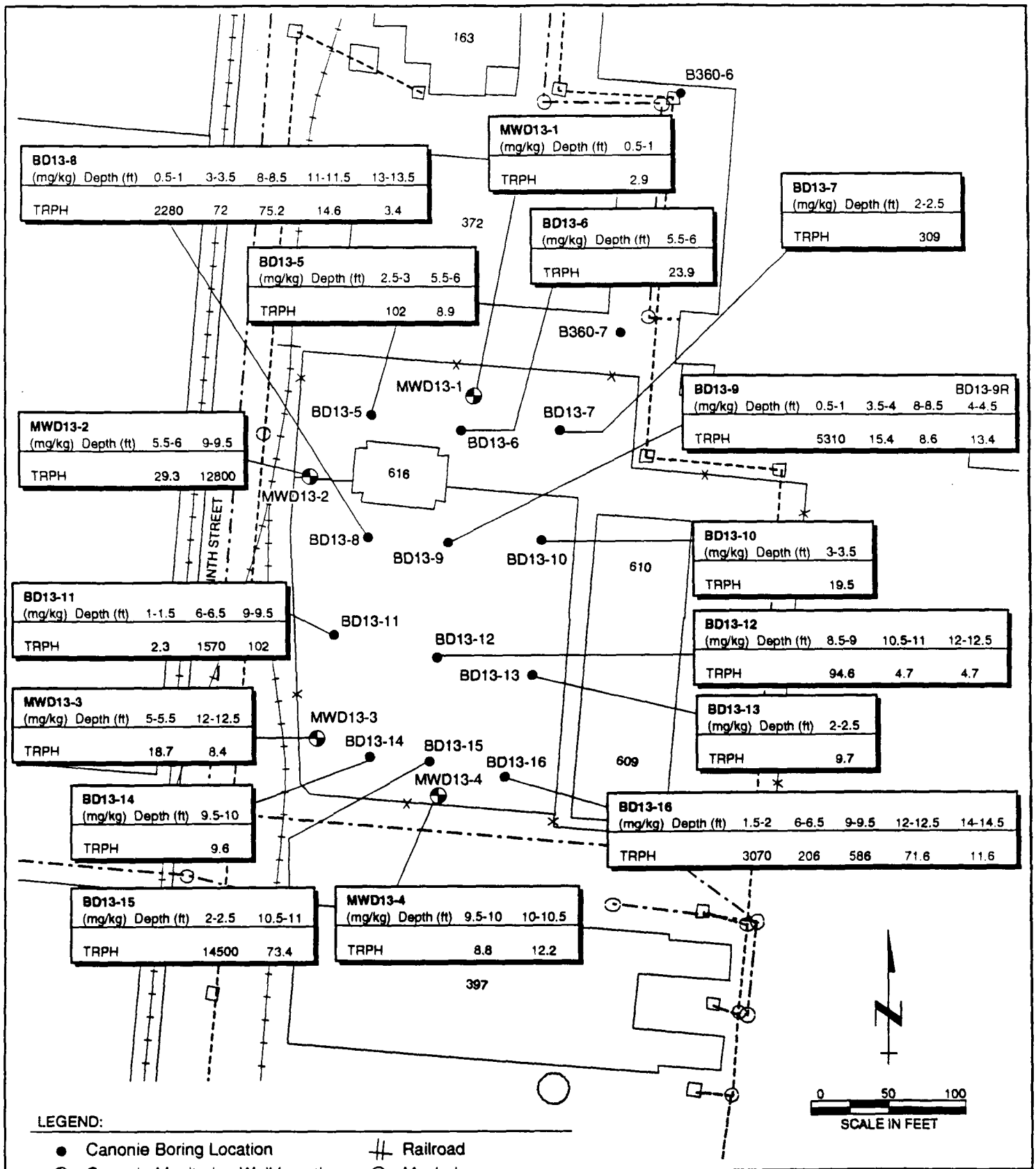
0 50 100
SCALE IN FEET

NAVAL AIR STATION ALAMEDA
ALAMEDA, CALIFORNIA
SITE 19 - YARD D-13,
HAZARDOUS WASTE STORAGE
SEMIVOLATILE ORGANIC COMPOUNDS IN SOI

FIGURE 14-4



LEGEND:

- Canonie Boring Location
- Canonie Monitoring Well Location
- Fence
- Sanitary Sewer Line
- Storm Sewer Line
- Railroad
- Manhole
- Catch Basin

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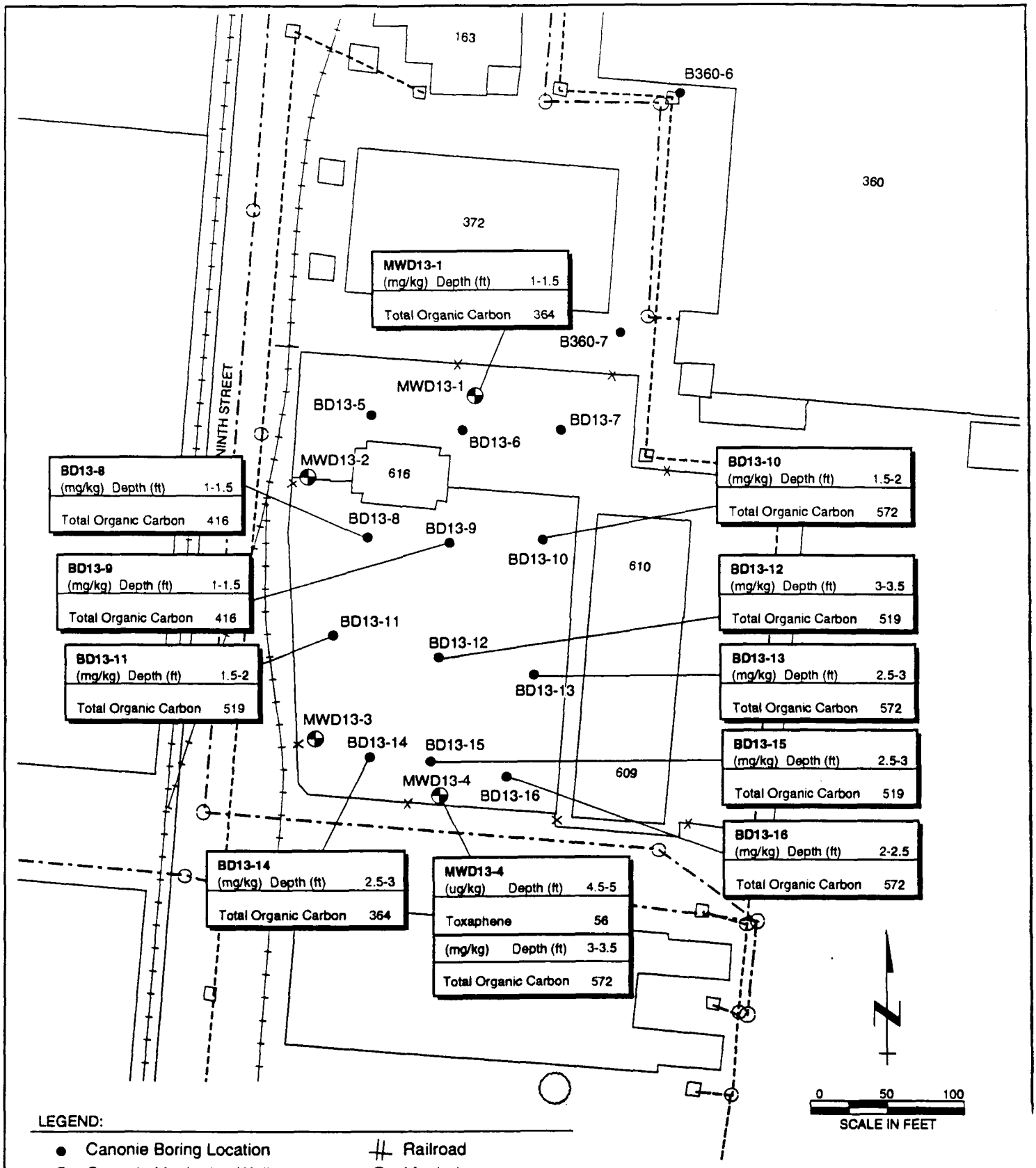
A-22

NAVAL AIR STATION ALAMEDA
ALAMEDA, CALIFORNIA

SITE 19 - YARD D-13
HAZARDOUS WASTE STORAGE
TOTAL RECOVERABLE PETROLEUM HYDROCARBONS IN SOIL

FIGURE 14-5



LEGEND:

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- Canonie Monitoring Well Location
- Fence
- Sanitary Sewer Line
- Storm Sewer Line
- Railroad
- Manhole
- Catch Basin

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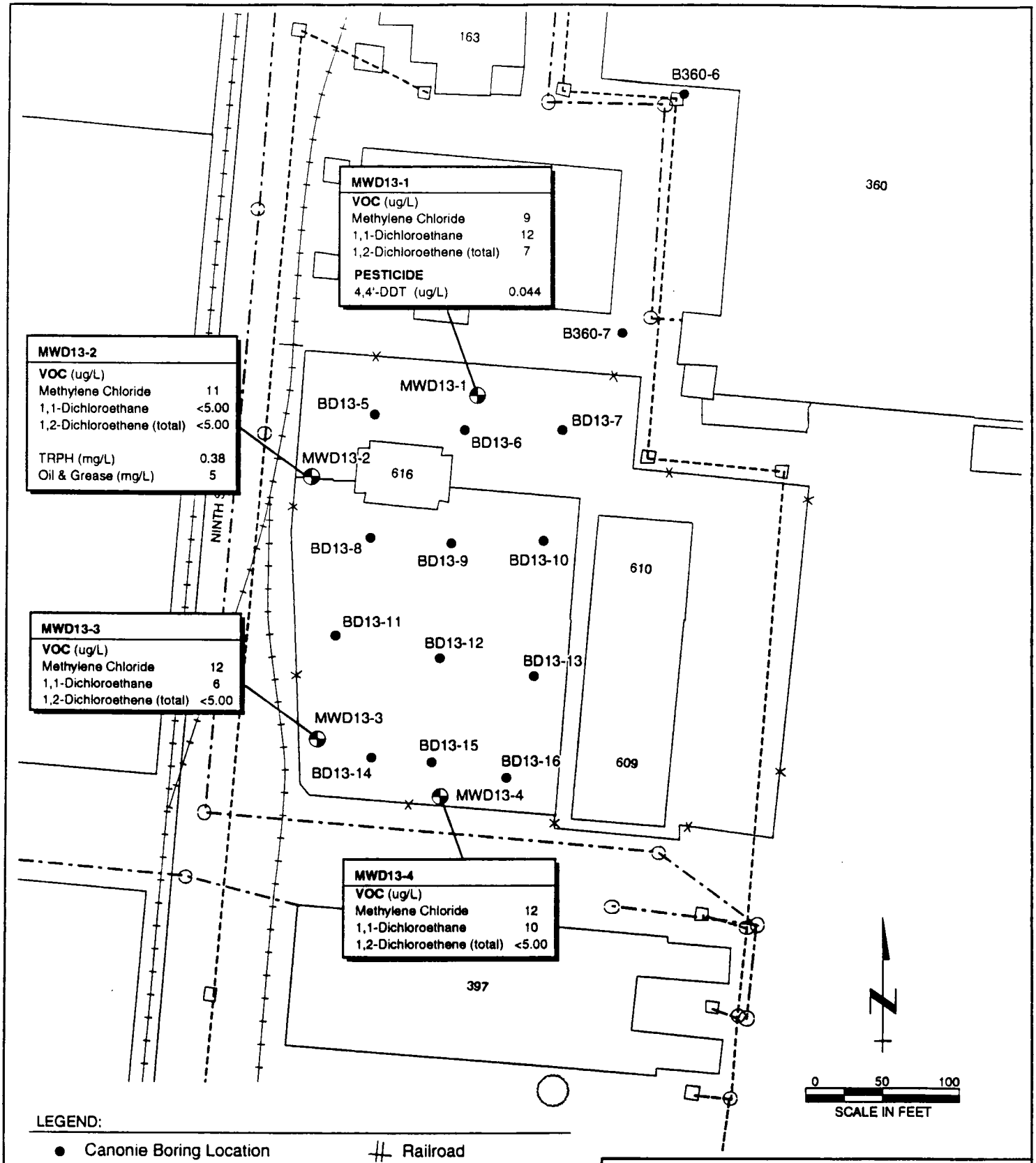
A-22

NAVAL AIR STATION ALAMEDA
ALAMEDA, CALIFORNIA

SITE 19 - YARD D-13
HAZARDOUS WASTE STORAGE
PESTICIDE AND PCB COMPOUNDS AND
TOTAL ORGANIC CARBON IN SOIL

FIGURE 14-6



LEGEND:

- Canonie Boring Location
- Canonie Monitoring Well Location
- Fence
- Sanitary Sewer Line
- Storm Sewer Line
- Railroad
- Manhole
- Catch Basin

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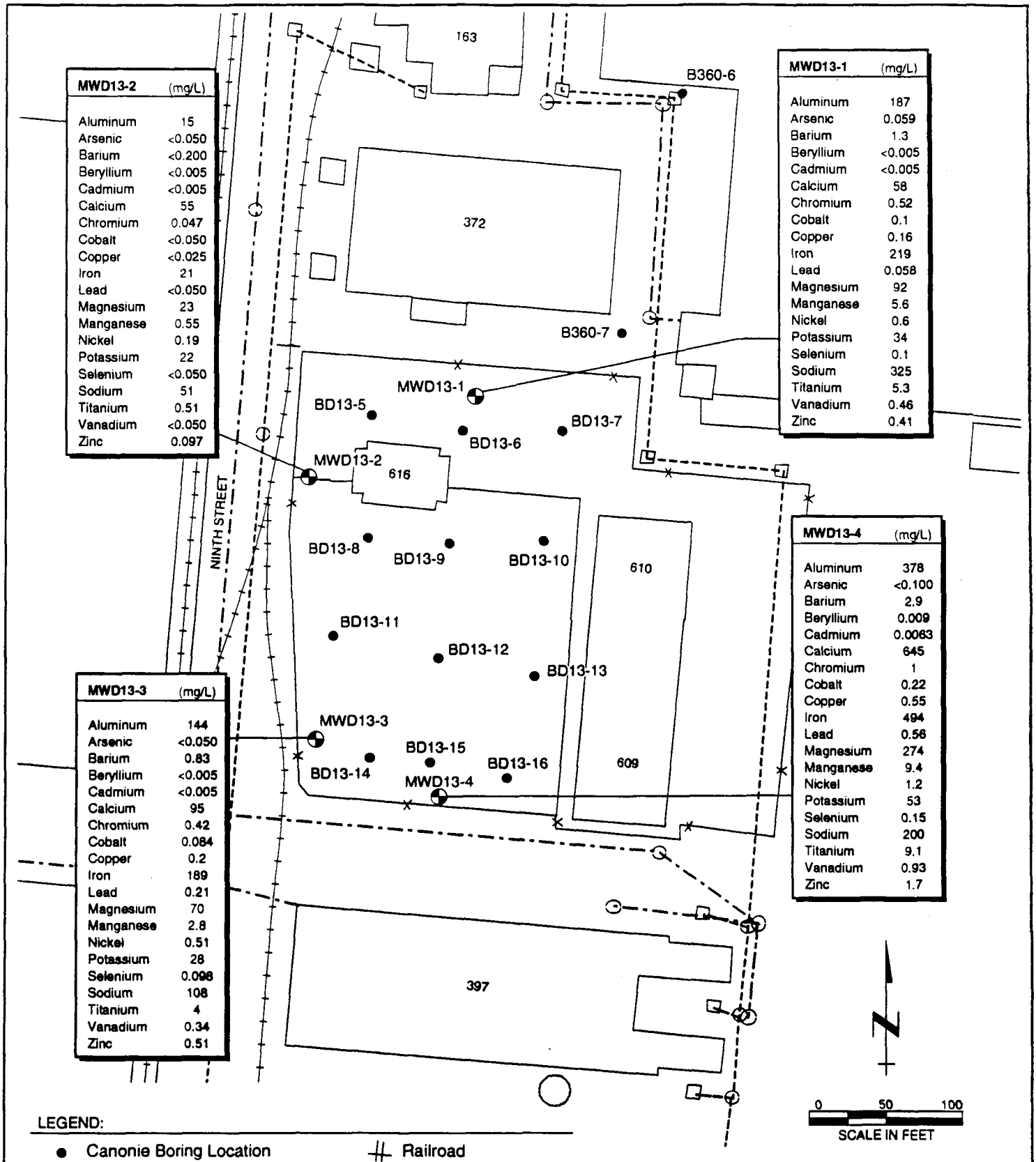
A-22

NAVAL AIR STATION ALAMEDA
ALAMEDA, CALIFORNIA

SITE 19 - YARD D-13
HAZARDOUS WASTE STORAGE
VOLATILE ORGANIC COMPOUNDS, PESTICIDE COMPOUNDS, TRPH AND OIL AND GREASE IN GROUNDWATER

FIGURE 14-7



MWD13-2	(mg/L)
Aluminum	15
Arsenic	<0.050
Barium	<0.200
Beryllium	<0.005
Cadmium	<0.005
Calcium	55
Chromium	0.047
Cobalt	<0.050
Copper	<0.025
Iron	21
Lead	<0.050
Magnesium	23
Manganese	0.55
Nickel	0.19
Potassium	22
Selenium	<0.050
Sodium	51
Titanium	0.51
Vanadium	<0.050
Zinc	0.097

MWD13-1	(mg/L)
Aluminum	187
Arsenic	0.059
Barium	1.3
Beryllium	<0.005
Cadmium	<0.005
Calcium	58
Chromium	0.52
Cobalt	0.1
Copper	0.16
Iron	219
Lead	0.058
Magnesium	92
Manganese	5.6
Nickel	0.6
Potassium	34
Selenium	0.1
Sodium	325
Titanium	5.3
Vanadium	0.46
Zinc	0.41

MWD13-4	(mg/L)
Aluminum	378
Arsenic	<0.100
Barium	2.9
Beryllium	0.009
Cadmium	0.0063
Calcium	645
Chromium	1
Cobalt	0.22
Copper	0.55
Iron	494
Lead	0.56
Magnesium	274
Manganese	9.4
Nickel	1.2
Potassium	53
Selenium	0.15
Sodium	200
Titanium	9.1
Vanadium	0.93
Zinc	1.7

MWD13-3	(mg/L)
Aluminum	144
Arsenic	<0.050
Barium	0.83
Beryllium	<0.005
Cadmium	<0.005
Calcium	95
Chromium	0.42
Cobalt	0.084
Copper	0.2
Iron	189
Lead	0.21
Magnesium	70
Manganese	2.8
Nickel	0.51
Potassium	28
Selenium	0.098
Sodium	108
Titanium	4
Vanadium	0.34
Zinc	0.51

LEGEND:

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- Canonie Monitoring Well Location
- Fence
- Sanitary Sewer Line
- Storm Sewer Line
- Railroad
- Manhole
- Catch Basin

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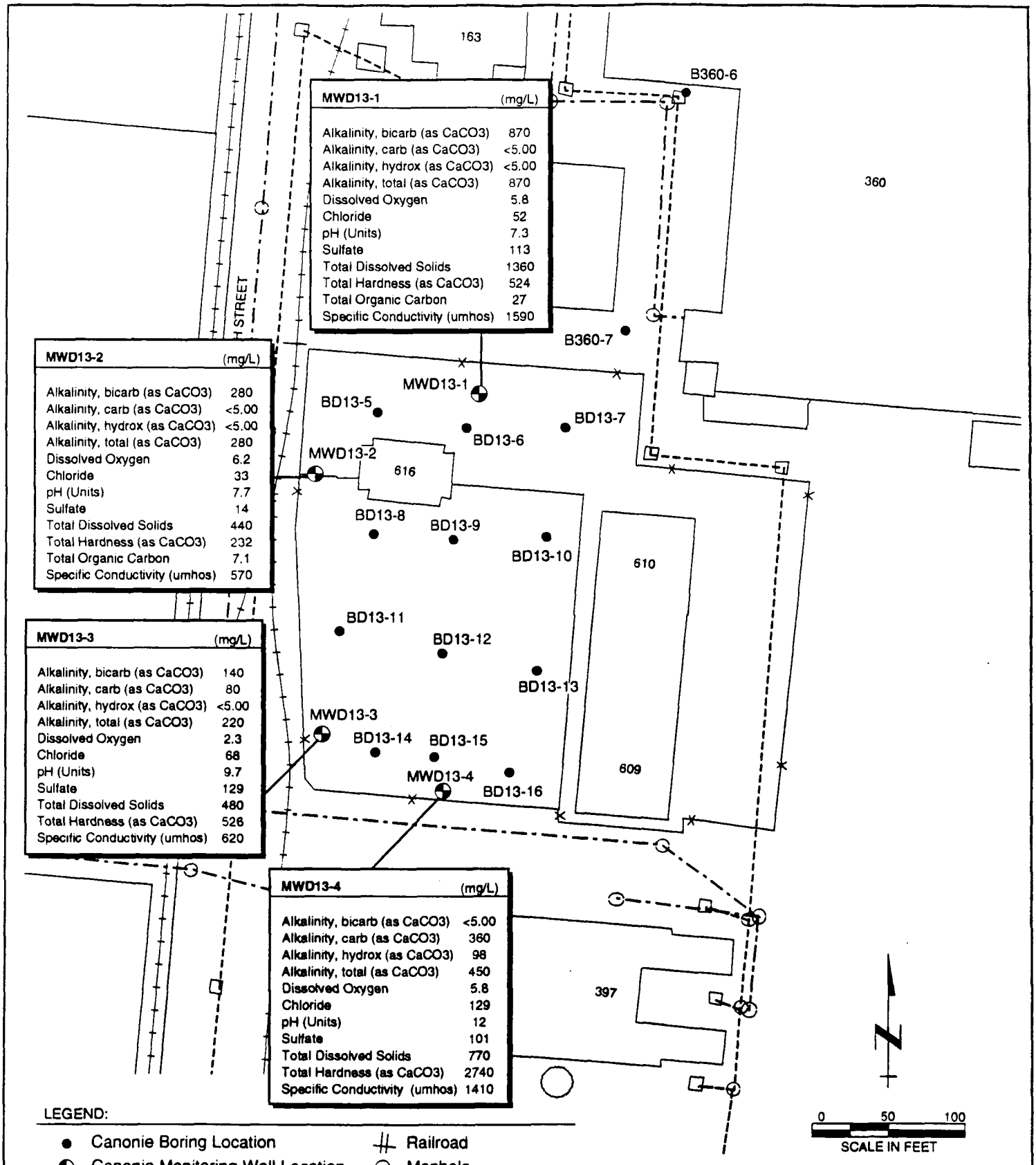
A-22

NAVAL AIR STATION ALAMEDA
ALAMEDA, CALIFORNIA

SITE 19 - YARD D-13
HAZARDOUS WASTE STORAGE
METALS IN GROUNDWATER

FIGURE 14-8



MWD13-1	(mg/L)
Alkalinity, bicarb (as CaCO3)	870
Alkalinity, carb (as CaCO3)	<5.00
Alkalinity, hydrox (as CaCO3)	<5.00
Alkalinity, total (as CaCO3)	870
Dissolved Oxygen	5.8
Chloride	52
pH (Units)	7.3
Sulfate	113
Total Dissolved Solids	1360
Total Hardness (as CaCO3)	524
Total Organic Carbon	27
Specific Conductivity (umhos)	1590

MWD13-2	(mg/L)
Alkalinity, bicarb (as CaCO3)	280
Alkalinity, carb (as CaCO3)	<5.00
Alkalinity, hydrox (as CaCO3)	<5.00
Alkalinity, total (as CaCO3)	280
Dissolved Oxygen	6.2
Chloride	33
pH (Units)	7.7
Sulfate	14
Total Dissolved Solids	440
Total Hardness (as CaCO3)	232
Total Organic Carbon	7.1
Specific Conductivity (umhos)	570

MWD13-3	(mg/L)
Alkalinity, bicarb (as CaCO3)	140
Alkalinity, carb (as CaCO3)	80
Alkalinity, hydrox (as CaCO3)	<5.00
Alkalinity, total (as CaCO3)	220
Dissolved Oxygen	2.3
Chloride	68
pH (Units)	9.7
Sulfate	129
Total Dissolved Solids	480
Total Hardness (as CaCO3)	526
Specific Conductivity (umhos)	620

MWD13-4	(mg/L)
Alkalinity, bicarb (as CaCO3)	<5.00
Alkalinity, carb (as CaCO3)	360
Alkalinity, hydrox (as CaCO3)	98
Alkalinity, total (as CaCO3)	450
Dissolved Oxygen	5.8
Chloride	129
pH (Units)	12
Sulfate	101
Total Dissolved Solids	770
Total Hardness (as CaCO3)	2740
Specific Conductivity (umhos)	1410

LEGEND:

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- Canonie Monitoring Well Location
- Fence
- Sanitary Sewer Line
- Storm Sewer Line
- Railroad
- Manhole
- Catch Basin

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NAVAL AIR STATION ALAMEDA
ALAMEDA, CALIFORNIA

SITE 19 - YARD D-13,
HAZARDOUS WASTE STORAGE
GENERAL CHEMICAL CHARACTERISTICS
OF GROUNDWATER

FIGURE 14-9

15.0 APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS

Applicable or relevant and appropriate requirements (ARARs) are used to determine the appropriate extent of site cleanup, develop site-specific remedial response objectives, develop remedial action alternatives, and direct site cleanup. The Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), as amended by the Superfund Amendments and Reauthorization Act (SARA), and the National Contingency Plan (NCP), requires that hazardous waste site remedial actions, including those at federal facilities, comply with federal ARARs. SARA also requires attainment of state ARARs if they are more stringent than federal ARARs, legally enforceable, and consistently enforced statewide.

15.1 APPLICABILITY OF REGULATORY REQUIREMENTS AT FEDERAL FACILITIES

Section 120 of CERCLA provides guidance for the remediation of hazardous constituents released from federal facilities. CERCLA requires that each department, agency, and instrumentality of the United States government, including executive, legislative, and judicial branches of the government, be subject to and comply with CERCLA. Under Executive Order 12580 - Superfund Implementation, the President of the United States delegated to the Secretary of Defense the responsibility of responding to releases or threats of releases of hazardous contaminants from any facility or vessel under jurisdiction of the Department of Defense (DOD). Section 2701 of SARA - the Environmental Restoration Program authorizes the Secretary of Defense to carry out a program of environmental restoration at facilities under its jurisdiction. DOD environmental restoration activities must be carried out in a manner consistent with Section 120 of CERCLA.

15.2 DEFINITION AND DEVELOPMENT OF ARARs

An ARAR may be either applicable or relevant and appropriate, but not both. According to the NCP, "applicable" and "relevant and appropriate" are defined as follows:

- Applicable requirements are those cleanup standards, standards of control, and other substantive environmental protection requirements, criteria, or limitations promulgated under state or federal environmental or facility siting laws that specifically address a hazardous substance, pollutant, contaminant, remedial action, location, or other circumstance found at a CERCLA site. Only those state standards that are identified by a state in a timely manner and are more stringent than federal requirements may be applicable.

- Relevant and appropriate requirements are those cleanup standards, standards of control, and other substantive environmental protection requirements, criteria, or limitations promulgated under state or federal environmental or facility siting laws that, while not "applicable" to a hazardous substance, pollutant, contaminant, remedial action, location, or other circumstance at a CERCLA site, address problems or situations sufficiently similar to those encountered at

the CERCLA site that their use is well suited to the particular site. Only those state standards that are identified in a timely manner and are more stringent than federal requirements may be relevant and appropriate.

Requirements that are applicable or relevant and appropriate must be met by CERCLA remedial actions; other types of standards or guidance information fall into the "to be considered" (TBC) category. TBCs are federal and state advisories or guidance that are not legally binding and do not have the status of potential ARARs. However, if there are no specific ARARs for a chemical or site condition, or if existing ARARs are not deemed sufficiently protective, then guidance or advisory criteria should be identified and used to ensure public health and environmental protection.

Section 121(d)(4) of CERCLA identifies the following six circumstances under which ARARs may be waived. An ARAR may only be waived for on-site remedial actions.

- The remedial action selected is only a part of a total remedial action (interim remedy) and the final remedy will attain the ARAR upon its completion.
- Compliance with the ARAR will result in a greater risk to human health and the environment than alternative options.
- Compliance with the ARAR is technically impracticable from an engineering perspective.
- An alternative remedial action will attain an equivalent standard of performance through the use of another method or approach.
- The ARAR is a state requirement that the state has not consistently applied (or demonstrated the intent to apply consistently) in similar circumstances.
- For Section 104 Superfund-financed remedial actions, compliance with the ARAR will not provide a balance between protecting human health and the environment and the availability of Superfund money for response at other facilities.

15.3 ARARs DEVELOPMENT

Identification of ARARs must be done on a site-specific basis. Neither SARA nor the NCP provide across-the-board standards for establishing specific cleanup goals at a particular site. Rather, the process recognizes that each site will have unique characteristics that must be evaluated and compared to those requirements that apply under the given circumstances. Described below are the three different types of requirements, chemical-specific, location-specific, and action-specific, that CERCLA actions may have to comply with. A discussion of these requirements as they apply to NAS Alameda is presented in Section 15.4.

15.3.1 Chemical-Specific ARARs

Chemical-specific ARARs are usually health- or risk-based numerical values or methodologies that represent acceptable concentrations of chemicals that may be found in, or discharged to, the ambient environment. If a chemical has more than one ARAR, the most stringent ARAR generally should be complied with. Both ARARs and TBCs should be subject to a site-specific risk assessment to ensure exposure levels are within acceptable limits for the protection of human health and other environmental receptors. In some cases, such as multiple exposure pathways or multiple contaminants, a risk assessment may indicate that an ARAR alone is not sufficiently protective and TBCs, including risk-based limits, will be used to establish cleanup requirements.

15.3.2 Location-Specific ARARs

Location-specific ARARs are restrictions placed on the concentration of hazardous substances or restrictions on the conduct of activities solely because the sites are in specific types of locations. Some examples of special locations include floodplains, wetlands, historic places, and sensitive ecosystems or habitats.

15.3.3 Action-Specific ARARs

Action-specific ARARs are requirements or limitations on specific potential remedial actions. The type and nature of these requirements are dependent upon the particular remedial or removal action taken at a site, and thus different actions or technologies are often subject to different action-specific ARARs. An example would be the restriction against exhausting off-gases from an air stripper due to air- quality requirements.

15.4 IDENTIFICATION OF CHEMICAL-SPECIFIC AND LOCATION-SPECIFIC ARARs

For the Phases 1 and 2A investigation at NAS Alameda, potential chemical-specific ARARs and TBCs for groundwater have been identified by reviewing the EPA draft guidance document, CERCLA Compliance with Other Laws Manual, and state-specific regulations and criteria (EPA, 1988f). Chemical-specific ARARs identified here are preliminary and will be subject to review by the DTSC and finalized as part of the Phase 7 comprehensive RI planned for NAS Alameda. Action-specific requirements will be identified when remedial alternatives are developed in the FS that will be performed as Phase 8. Location-specific ARARs will be also determined as part of the Phase 7 comprehensive RI.

The following paragraphs describe the specific ARARs that apply to the Phases 1 and 2A investigation.

Maximum contaminant levels (MCLs) established for drinking water by the EPA under the Safe Drinking Water Act (40 CFR Part 141) are applicable requirements when water will or would be used as a drinking water source for a community supply of 25 or more people, or 15 or more service connections. MCLs and non-zero maximum contaminant level goals (MCLGs) are relevant and appropriate requirements in other cases where surface water or groundwater is or may be directly used for drinking water, in which case the MCLs or MCLGs should be met in the surface water or groundwater itself. Due to the brackish and saline nature of the shallow groundwater at NAS Alameda, and the known groundwater quality problems related to nitrates and salt water intrusion in the East Bay Plain area, the shallow groundwater may not be considered a suitable potential drinking water source. Groundwater within deeper aquifers is no longer used due to naturally occurring mercury (E&E, 1983). If the RI concludes that the groundwater at NAS Alameda is not a suitable potential drinking water source, MCLs will not be considered applicable chemical-specific ARARs.

The California Regional Water Quality Control Board (RWQCB), San Francisco Bay Region, has designated the groundwater basin in which Alameda Island lies for potential use as "domestic or municipal supply, industrial process supply, industrial service supply, and agricultural supply" (RWQCB, 1986). However, the RWQCB indicates that "local groundwater quality conditions may vary significantly, due to natural factors, making some groundwater supplies unsuitable for the uses indicated." Due to the brackish and saline nature of the shallow groundwater at NAS Alameda, and the known groundwater quality problems related to nitrates and salt water intrusion in the East Bay Plain area, the shallow groundwater may not be considered a suitable potential drinking water source. Groundwater within deeper aquifers is no longer used due to naturally occurring mercury (E&E, 1983). If the RI concludes that the groundwater at NAS Alameda is not a suitable potential drinking water source, water quality goals identified by the RWQCB for basins designated potential agricultural or municipal water supplies will not be considered applicable chemical-specific ARARs.

Applied action levels (AALs) are developed according to procedures outlined in The California Site Mitigation Decision Tree Manual (DHS, 1986). These values are based on maximum acceptable exposure of biological receptors to substances associated with hazardous waste sites and facilities. Thus, AALs are derived by considering human health effects without dealing with technical feasibility, economic concerns, or other factors. Since AALs are entirely health-based, they are different on both a criterion and use basis from standards developed by other agencies (e.g., water quality criteria developed by the EPA), and are therefore TBCs for NAS Alameda.

The EPA has established water quality criteria (WQC) for the protection of marine aquatic life (EPA, 1986a). Acute and/or chronic criteria have been established for selected organic and inorganic compounds. Federal WQC are summarized in Table 15-1. Due to the proximity of the site to the San Francisco Bay, and

the apparent discharge of shallow groundwater to the bay (Section 16.0), federal WQC are considered potential chemical-specific ARARs for shallow groundwater at NAS Alameda.

TABLE 15-1

POTENTIAL CHEMICAL-SPECIFIC ARARS

(Sheet 1 of 2)

	Marine Acute Criteria (µg/L)[a]	Marine Chronic Criteria (µg/L)[a]
Organic Compounds		
Acenaphthene	970	710
Acrolein	55	
Benzene	5,100	700
Carbon Tetrachloride	50,000	
Chlorinated Benzenes		
Monochlorobenzenes	160	129
Dichlorobenzenes	1,970	
Chlorinated Ethanes		
Dichloroethanes	113,000	
Trichloroehanes	31,200	
Tetrachloroethanes	9,020	
Pentachloroethanes	390	
Hexachloroethanes	940	
Chlorinated Ethylenes		
Dichloroethylenes	224,000	
Trichloroethylenes	2,000	
Tetrachloroethylenes	10,200	450
Chlorinated Naphthalenes	7.5	
Chlorinated Phenols		
Monochlorophenols	29,700	
Tetrachlorophenols	440	
Pentachlorophenols	53	34
Dichloropropane	10,300	3,040
Dichloropropene	790	
Dinitrotoluene	590	
Ethylbenzene	430	
Fluoranthene	40	16
Halomethanes	12,000	6,400
Hexachlorobutadiene	32	
Hexachlorocyclopentadiene	7.0	
Isophorone	12,900	
Naphthalene	2,350	
Nitrobenzene	6,680	
Nitrophenols	4,850	
Nitrosamines	3,300,000	
Phenol	5,800	
Phthalate Esters	2,944	
Polynuclear Aromatic Hydrocarbons	300	
Toluene	6,300	5,000
Toxaphene	0.07[b]	
Pesticides/PCB		
Aldrin	1.3[b]	
BHC	0.34	
Chlordane	0.09[b]	0.0040[c]
DDE	14	
DDT	0.13[b]	0.0010[c]
Demeton		0.1
Dieldrin	0.71[b]	0.0019[c]

TABLE 15-1

POTENTIAL CHEMICAL-SPECIFIC ARARS

(Sheet 2 of 2)

	Marine Acute Criteria (µg/L)[a]	Marine Chronic Criteria (µg/L)[a]
Endosulfan	0.034[b]	0.0087[c]
Endrin	0.037[b]	0.0023[c]
Guthion		0.01
Heptachlor	0.053[b]	0.0036[c]
Lindane	0.16[b]	
Malathion		0.1
Methoxychlor		0.03
Mirex		0.001
Parathion		0.04
PCB		0.030[c]
TDE	3.6	
Inorganic Compound		
Chlorine	13[d]	7.5[e]
Cyanide	1[d]	
Hydrogen Sulfide		2
Phosphorous		0.10
Metals		
Arsenic	69[d]	36[e]
Arsenic (pent)	2,319[d]	
Arsenic (trivalent)	69[d]	36[e]
Cadmium	43[d]	9.3[e]
Chromium (hexavalent)	1,100[d]	50[e]
Copper	2.9[d]	
Lead	140[d]	5.6[e]
Manganese		100[f]
Mercury	2.1	0.025
Nickel	140[b]	7.1[c]
Selenium (inorganic selenite)	410[b]	54[c]
Silver	2.3[b]	
Thallium	2130	
Zinc	170[b]	58[c]

[a] - All criteria from EPA Quality Criteria for Water 1986. Methods used to establish acute and chronic criteria vary by compound.

[b] - Represents a maximum concentration never to be exceeded.

[c] - Represents a maximum 24-hour average.

[d] - Represents the 1-hour average concentration which may not be exceeded more than once every 3 years.

[e] - Represents the 4-day average concentration which may not be exceeded more than once every 3 years.

[f] - Represents maximum allowable concentration to protect human consumers of shellfish.

16.0 PUBLIC HEALTH AND ENVIRONMENTAL EVALUATION

Canonie developed a public health and environmental evaluation (PHEE) plan as part of the work plan for NAS Alameda (Canonie, 1990a). The PHEE plan addresses 20 sites and contains what Canonie described as a preliminary PHEE, which was performed using information from a review of site history and industrial activities and operations. The preliminary PHEE used some chemical data obtained in the historical review; however, since they were from limited investigations, the data were sometimes of uncertain application. While the preliminary PHEE was exhaustive in considering potential worker, visitor, resident, and ecological exposure pathways, it also concluded that "no data exist to quantitatively evaluate potential human health risks that may be posed by contaminants at NAS Alameda." This preliminary PHEE was used, in part, to develop the Canonie RI/FS sampling plan, which was used as the basis for planning and conducting the work presented in this Data Summary Report.

The preliminary PHEE by Canonie followed EPA guidance applicable in 1989, which was "Superfund Public Health Evaluation Manual (SPHEM), October 1986," and Chapter 5, "Evaluate Protection of Public Health Requirements" from Guidance on Feasibility Studies under CERCLA, June, 1985. While the principles applied in developing the preliminary PHEE are largely the same as current guidance, some of the specific approaches and data used are not in accordance with current guidance and knowledge (USEPA, 1989).

The discussion presented here expands upon and updates the preliminary PHEE prepared by Canonie. The discussion consists of a preliminary pathway analysis based upon the conceptual site model described in Section 2. This preliminary pathway analysis is intended to identify exposure pathways that have the most likely potential for being complete. A comprehensive risk assessment will further address these issues in the RI.

16.1 POTENTIAL RECEPTORS

Three potential receptors have been identified for this evaluation. These are humans, terrestrial organisms, and marine organisms. Freshwater organisms are not considered potential receptors for this evaluation because there is no fresh surface water near any of the sites in this study. Freshwater receptors may be included in the risk assessment portion of NAS Alameda comprehensive RI because parts of the base with fresh surface water will be addressed in that report.

16.1.1 Human Receptors

Human receptors include workers and visitors to the base. For purposes of this preliminary evaluation, all human receptors are grouped together and no specific exposure scenarios are identified. Special receptor groups and exposure scenarios will be identified and fully discussed in the risk assessment portion of the comprehensive RI.

16.1.2 Terrestrial Organisms

Terrestrial organisms include all plants and nonaquatic animals found at NAS Alameda. For purposes of this preliminary evaluation, special categories of organisms, such as endangered species, have not been identified. Identification of special populations and exposure scenarios will be performed during the risk assessment portion of the comprehensive RI.

16.1.3 Marine Organisms

Marine organisms include the benthic biota inhabiting the bay and estuaries surrounding Alameda Island. Human consumption of benthic organisms as a secondary exposure route is not considered in this preliminary evaluation because the part of San Francisco Bay near NAS Alameda has been closed to harvesting of benthic organisms for many years. This secondary exposure route may be addressed during the risk assessment portion of the comprehensive RI.

16.2 POTENTIAL EXPOSURE PATHWAYS

Seven potential exposure pathways have been identified for this evaluation. Five of the pathways apply to human and terrestrial organism receptors. Two of the pathways apply to marine organism receptors. Table 16-1 illustrates which potential exposure pathways are complete for the receptors identified above. The individual pathways are discussed below. In the absence of exposure scenarios and fate and transport analysis, only the possibility of exposure to the receptors via each pathway is assessed in this preliminary evaluation. The likelihood of exposure will be assessed in the risk assessment portion of the comprehensive RI.

16.2.1 Human and Terrestrial Organism Receptors

The five potential exposure pathways identified for human and terrestrial organism receptors are drinking water, soil and dust ingestion, inhalation of dust, inhalation of vapors, and dermal contact.

16.2.1.1 Drinking Water. No human drinking water is currently derived from surface or groundwater at NAS Alameda. Currently, all human drinking water is supplied by the East Bay Municipal Utility District (EBMUD). It is not likely that drinking water will be derived from surface or groundwater at NAS Alameda in the future because, as discussed in Section 2, the shallowest aquifer is subject to salt water intrusion and naturally occurring elevated nitrate concentrations; the deeper aquifers are subject to naturally occurring mercury concentrations. No terrestrial organisms use the groundwater for drinking water and there is no surface water at any of the sites except at Site 2. For these reasons, the drinking water pathway is considered incomplete for human and terrestrial organism receptors at all of the sites except Site 2 studied for this project. Since surface water is present, the drinking water pathway is considered complete for terrestrial organisms in the surface water portion of Site 2.

16.2.1.2 Soil and Dust Ingestion. Inadvertent ingestion of surface soil or dust by humans or terrestrial organisms may occur when soil and dust are exposed and available to the receptors. In order for this exposure pathway to be complete, the site must be unpaved so that the soil is exposed. Currently, only Sites 1, 2, 3, 13, and 16 are unpaved. The soil ingestion pathway is considered complete for both humans and terrestrial organisms at the unpaved portions of Sites 1, 2, 3, 13 and 16.

The interior of the Site 4 (Building 360) plating shop contains dust that could be inadvertently ingested by humans working in or visiting the building. Therefore, the pathway is considered complete for humans. It is unlikely that terrestrial organisms can enter the plating shop, so the pathway is considered incomplete for this receptor.

16.2.1.3 Inhalation of Dust. Fugitive dust is dust that can be blown about a site so that it is made available for human or terrestrial organisms to inhale. Most sites are covered with pavement so dust cannot escape; therefore, the inhalation of dust exposure pathway is considered incomplete for Sites 4, 7, 9, 10, 19, and the paved portions of Sites 13 and 16. As with the soil and dust ingestion pathway, the dust inhalation pathway is complete for both humans and terrestrial organisms at Sites 1, 2, 3, 13, and 16. The pathway is considered complete for humans in the Site 4 plating shop.

16.2.1.4 Inhalation of Vapors. Contaminants can volatilize, releasing vapors that are available for inhalation by human or terrestrial organism receptors. This only occurs when the compounds are in contact with the atmosphere and have sufficiently high vapor pressures to volatilize. This pathway is considered incomplete at all of the study sites for two reasons. First, all of the sites except Sites 1, 2, 3, 13, and 16 are paved, thus preventing atmospheric contact. Second, compounds with sufficiently high vapor pressures to volatilize under normal atmospheric conditions were not encountered at the unpaved sites.

16.2.1.5 Dermal Contact. Human and terrestrial organism receptors may inadvertently come into contact with contaminated media when the media are exposed. The same constraints about exposure of the contaminated media for dust inhalation and soil and dust ingestion apply to dermal contact. Therefore, like these other pathways, the dermal contact pathway is considered complete for both humans and terrestrial organisms at Sites 1, 2, 3, 13, and 16. The pathway is considered complete for humans in the Site 4 plating shop.

16.2.2 Marine Organism Receptors

The two potential exposure pathways identified for marine organism receptors are ingestion and dermal contact.

16.2.2.1 Ingestion. Marine benthic organisms may ingest contaminated groundwater in the event that it reaches the bay and estuary that surrounds NAS Alameda. In the absence of fate and transport analyses, it has been assumed that groundwater from all of the sites may reach the bay and estuary. The pathway is therefore considered complete for all sites.

Detailed fate and transport analysis will be conducted during the comprehensive RI stage of work at NAS Alameda. After that analysis, the marine organism ingestion exposure pathway may be shown to be incomplete for some or all of the current study sites.

16.2.2.2 Dermal Contact. As with the marine organism ingestion exposure pathway, the marine organism dermal contact exposure pathway has been assumed to be complete for all sites until detailed fate and transport analyses are performed.

TABLE 16 - 1

POTENTIAL PATHWAYS ANALYSIS

Site	Human and Terrestrial Organism Receptors						Marine Organism Receptors
	Drinking Water	Soil and Dust Ingestion	Inhalation of Dust	Inhalation of Vapors	Dermal Contact	Ingestion*	Dermal Contact*
Site 1 - Disposal Area	I	C	C	I	C	C	C
Site 2 - West Beach Landfill	C	C	C	I	C	C	C
Site 3 - Area 97	I	C	C	I	C	C	C
Site 4 - Building 360	I	C	C	I	C	C	C
Site 7C - Building 547	I	I	I	I	I	C	C
Site 9 - Building 410	I	I	I	I	I	C	C
Site 10B - Building 530	I	I	I	I	I	C	C
Site 13 - Former Oil Refinery	I	C	C	I	C	C	C
Site 16 - CANS C-2 Area	I	C	C	I	C	C	C
Site 19 - Yard D-13	I	I	I	I	I	C	C

I = Pathway Incomplete

C = Pathway Complete

* = Pathway tentatively complete pending fate and transport analysis

17.0 CONCLUSIONS AND RECOMMENDATIONS

This section presents conclusions and recommendations of the Phases 1 and 2A investigation performed by Canonie in 1990. The preliminary recommendations presented in this section are based on a qualitative evaluation of data without the benefit of fate and transport analyses, a risk assessment, or a determination of ARARs. A thorough analysis of the data and a reassessment of the conclusions presented will be conducted during the comprehensive RI/FS process. Data presented in this report are used only for qualitative assessment of the chemical conditions of surface soil, subsurface soil, and groundwater at these ten Phases 1 and 2A sites, and for identification of the need for additional activities, such as drilling and sampling, at this stage of the site investigation.

17.1 CONCLUSIONS

Conclusions for each one of the ten Phases 1 and 2A sites are presented in the following sections.

17.1.1 Site 1 Soil - 1943-1956 Disposal Area

- SVOCs, metals, pesticides and PCBs, and TRPH were detected in the surface soil samples. According to site history, the surface soil is likely the hydraulic fill from the former oil refinery area that was placed to cover the buried material. Therefore, these detectable chemicals may have been present in the hydraulic fill prior to being placed at Site 1. Sufficient soil data have not been collected for the area around boring DA-2 and the "Alpha Area" to characterize the surface soil at Site 1.

- One surface soil sample collected from boring DA-2 was found to contain the PCB Aroclor-1248 above 1 mg/kg. Aroclor-1260 was also detected above 1 mg/kg in the surface samples from DA-1, L0, L1, M1, and G4. Additional surface soil samples may be necessary to further characterize the extent of PCBs in the vicinity of these sample locations.

17.1.2 Site 2 Soil - West Beach Landfill

- Only one soil sample, collected from boring WB-3, contained a total SVOC concentrations above 10 mg/kg. No soil samples contained total VOC or pesticides and PCBs at concentrations above 1 mg/kg. The soil around boring WB-3 may have been significantly impacted by SVOCs. Combining these data with the data collected during the Phases 5 and 6 investigation, it is concluded that sufficient soil data have been collected to characterize the presence of SVOCs and other organics, as well as metals, in soil at Site 2.

17.1.3 Site 3 Soil - Area 97, Abandoned Fuel Storage Area

- Concentrations of VOCs and SVOCs in soil samples collected from the storage area and to the northeast do not exceed the corresponding preliminary comparison levels. EDB was not detected in the soil samples. However, sufficient soil data have not been collected to the north and northwest of the site for the RI/FS evaluation. TRPH concentrations exceeded the preliminary comparison level in monitoring well MW97-1, located north of the site, and MW97-3, at the site.

- None of Canonie's soil samples were collected from the areas where elevated soil gas levels were found, nor from areas where previous investigations detected high hydrocarbon concentrations such as near the storm and sanitary sewer fill material. Therefore, additional soil investigation of the area northwest of the site and near the 1985 trench is necessary to evaluate the VOCs, petroleum hydrocarbons, and metals in the subsurface.

17.1.4 Site 3 Groundwater - Area 97, Abandoned Fuel Storage Area

- VOCs, SVOCs, and EDB were not detected in the groundwater at Site 3. However, both soil gas and soil analyses results suggest the potential for groundwater at the site to be impacted by these chemicals. Additional groundwater well(s) are required to evaluate the TPH in the groundwater to the west and northwest.

- The groundwater flow direction is not adequately defined at the site; therefore, additional monitoring is necessary to characterize the local groundwater flow in order to sufficiently evaluate the existing data.

- Metals are present in the groundwater at concentrations exceeding the 95 percent/95 percent statistical tolerance interval for NAS Alameda. Additional data are required to characterize the groundwater quality at this site.

- Additional TDS data are required to evaluate whether groundwater beneath the site is considered as potential drinking water.

- At present, no information is available to evaluate the tidal influence on groundwater and the deeper groundwater-bearing zone. Additional work is required to evaluate the tidal influence and the deeper groundwater-bearing zone.

17.1.5 Site 4 Soil - Building 360, Aircraft Engine Facility

- Results of VOC and SVOC analyses performed on soil samples did not indicate a major source of VOCs and SVOCs in soil in the vicinity of Building 360. However, results of VOC analyses performed on groundwater samples indicated that a VOC source may be present in the area. Therefore, additional investigation is necessary inside the building to assess whether Building 360 is a source for the VOCs in the groundwater.

- Because TRPH was detected in groundwater and no petroleum hydrocarbon analyses were performed on the soil samples, additional soil investigation is required to evaluate whether the soil has been impacted by petroleum hydrocarbons.

- Sufficient soil metals data have been collected for the RI/FS evaluation.

17.1.6 Site 4 Groundwater - Building 360, Aircraft Engine Facility

- Elevated concentrations of TCE have been found in groundwater samples collected from monitoring wells MW360-1, MW360-2, and MW360-4. Additional groundwater wells are required to further evaluate the extent of TCE in groundwater, particularly towards the east, which is a residential neighborhood.

- Metals are present in the groundwater at concentrations that exceed the 95 percent/95 percent statistical tolerance level. Additional data are required to characterize the groundwater quality at this site.

- Additional TDS data are required to evaluate whether groundwater beneath the site is considered as potential drinking water.

- At present, no information is available to evaluate the tidal influence on groundwater and the deeper groundwater-bearing zone. Additional work is required to evaluate the tidal influence and the deeper groundwater-bearing zone.

17.1.7 Site 7C Soil - Building 547, Service Station

- The soil at the site has been impacted by VOCs (primarily BTEX). Sufficient VOC data for soil have been collected for the RI/FS evaluation.

- Because the TRPH analysis included both the light and heavy fractions of petroleum hydrocarbons, additional soil sampling is required to separately characterize the light and heavy fractions of petroleum hydrocarbons.

- Sufficient metals data for soil have been collected for the RI/FS evaluation.

17.1.8 Site 7C Groundwater - Building 547, Service Station

- Because only one sampling quarter of groundwater data is available, additional groundwater data will be required to characterize the groundwater quality and its seasonal variation at this site.

- Metals are present in the groundwater at concentrations exceeding the 95 percent/95 percent statistical tolerance interval.

- Currently, no downgradient well is present south of monitoring wells MW547-3, MW547-4, and MW547-5 to further define the extent of VOCs in groundwater at the site.

- TDS data are required to evaluate whether groundwater beneath the site is considered potential drinking water.

- At present, no information is available to evaluate the tidal influence on groundwater and the deeper groundwater-bearing zone. Additional work is required to evaluate the tidal influence and the deeper groundwater-bearing zone.

17.1.9 Site 9 Soil - Building 410, Paint Stripping

- Concentrations of VOCs in soil do not exceed the preliminary comparison levels. Based on the existing data, concentrations of VOCs are low and are unlikely to pose a significant adverse impact to the environment. Sufficient VOC data have been collected for the RI/FS evaluation at this site.

- Concentrations of SVOCs in soil exceed the preliminary comparison level in only one sample from boring B410-7. It is believed that sufficient SVOC data have been collected for the RI/FS evaluation at this site.

- Sufficient soil metals data have been collected for the RI/FS evaluation.

17.1.10 Site 9 Groundwater - Building 410, Paint Stripping

- Both upgradient and downgradient wells have similar concentrations of methylene chloride (possible lab artifact). SVOCs were not detected at the site. However, an additional groundwater well should be installed in the vicinity of boring B410-7, where SVOCs in soil exceeded the preliminary comparison level. This well will help to evaluate whether SVOCs are present in the groundwater. Additional groundwater sampling is required to verify that the groundwater at the site has not been impacted by the VOCs.

- Metals are present in the groundwater at concentrations exceeding the 95 percent/95 percent statistical tolerance interval for NAS Alameda. Additional data are required to characterize the groundwater quality and to understand the seasonal changes in the groundwater quality at this site.

- Additional TDS data are required to evaluate whether groundwater beneath the site is considered potential drinking water.

- At present, no information is available to evaluate the tidal influence on the groundwater and the deeper groundwater-bearing zone. Additional work is required to evaluate the tidal influence and the deeper groundwater-bearing zone.

17.1.11 Site 10B Soil - Building 530, Missile Rework Operations

- Elevated levels of VOCs were found in soil samples collected from monitoring wells MW530-1 and MW530-2, and elevated levels of SVOCs were found in soil samples collected from well MW530-1. Additional soil investigation is required to further characterize the VOCs and SVOCs found at these locations.

- Elevated levels of TRPH were found in soil samples from well MW530-1; additional soil investigation is required to characterize the petroleum hydrocarbons in the soil near well MW530-1.

- Sufficient soil metals data have been collected for the RI/FS evaluation.

17.1.12 Site 10B Groundwater - Building 530, Missile Rework Operations

- Groundwater in the local vicinity of monitoring well MW530-1 may have been impacted by VOCs, SVOCs, and petroleum hydrocarbons. Well MW530-1 is the farthest monitoring well upgradient at the site. Additional groundwater well(s) are necessary near MW530-1 to further characterize the VOCs, SVOCs, and petroleum hydrocarbons in the groundwater.

- Metals are present in the groundwater at concentrations exceeding the 95 percent/95 percent statistical tolerance interval for NAS Alameda. Additional data are required to characterize the groundwater quality at this site.

- Additional TDS data are required to evaluate whether groundwater beneath the site is considered as potential drinking water.

- At present, no information is available to evaluate the tidal influence on groundwater and the deeper groundwater-bearing zone. Additional work is required to evaluate the tidal influence and the deeper groundwater-bearing zone.

17.1.13 Site 13 Soil - Former Oil Refinery

- Concentrations of VOCs, SVOCs, and TRPH in soil samples that exceed the preliminary corresponding comparison levels are primarily found within localized areas in the vicinity of borings BOR-9, BOR-15, BOR-17, and BOR-19. With the exception of TRPH and BTEX, it is believed that sufficient data have been collected for the RI/FS evaluation at this site. Additional data are necessary to further evaluate the extent of TRPH in this area and near the IMF where previous investigations indicated elevated concentrations of TRPH.

- Soil in the saturated zone at boring BOR-26 appears to contain pesticides (Toxaphene) in excess of 1 mg/kg at 6 and 10.5 feet bgs. Additional data is needed to evaluate the extent of pesticides in soil near boring BOR-26. Elsewhere at the site, sufficient data have been collected to evaluate the extent of pesticides and PCBs.

- Sufficient soil metals data have been collected for the RI/FS evaluation.

17.1.14 Site 13 Groundwater - Former Oil Refinery

- Groundwater in the vicinity of borings BOR-9, BOR-15, BOR-17, and BOR-19 may have been impacted by VOCs, SVOCs, pesticides, and TRPH. Additional groundwater monitoring will be required to collect data for evaluating the potential risk of the presence of these chemicals in groundwater, as well as the seasonal variations of the groundwater quality.

- Metals are present in the groundwater at concentrations exceeding the 95 percent/95 percent statistical tolerance level. Additional data are required to characterize the groundwater quality and to understand the seasonal variations of the groundwater quality at this site.

- Additional TDS data are required to evaluate whether groundwater beneath the site is considered potential drinking water.

- At present, no information is available to evaluate the tidal influence on the groundwater and the deeper groundwater-bearing zone. Additional work is required to evaluate the tidal influence and the deeper groundwater-bearing zone.

- No groundwater monitoring wells are installed in areas near borings BOR-17 and BOR-19. Additional groundwater wells should be installed at these areas to evaluate the levels of TRPH and BTEX in groundwater beneath this area.

- No information is available on the groundwater quality and gradient along the northeastern site boundary. Additional groundwater wells should be installed along the eastern site boundary to evaluate whether the groundwater is flowing eastward into the residential neighborhood.

17.1.15 Site 16 Soil - CANS C-2 Area

- No soil samples were collected at the eastern side of the site. Therefore, additional soil sampling and analysis is required to characterize the surface and subsurface soil at the eastern side of the site.

- VOCs do not appear to be a major concern in surface and subsurface soil at the western side of the site.

- Soil samples collected at the northwestern part of the site contained total SVOC concentrations above 10 mg/kg and PCBs above 1 mg/kg, possibly indicating a potential source area. Additional data are required to characterize the distribution of the SVOCs and PCBs in this area.

- Soil samples from SSC2-28 also contained elevated PCB concentrations; therefore, additional soil investigation is required to characterize the PCBs around this area.

- Sufficient soil data for metals, pesticides, and cyanide are available for this site to proceed with the RI/FS.

17.1.16 Site 16 Groundwater - CANS C-2 Area

- Because TCE was not detected in the soil samples collected from this site and only a low concentration of TCE was found in well MWC2-2, it is unlikely that the presence of TCE in groundwater is due to an on-site source.

- Metals are present in the groundwater at concentrations exceeding the 95 percent/95 percent statistical tolerance interval.

- Because elevated levels of PCBs were found in surface soil samples, groundwater samples from Site 16 should also be analyzed for PCBs.

- Additional groundwater monitoring data are required to further evaluate the groundwater quality.

- Additional TDS data are required to evaluate whether groundwater beneath Site 16 is considered potential drinking water.

- At present, no information is available to evaluate the tidal influence on groundwater and the deeper groundwater-bearing zone. Additional work is required to evaluate the tidal influence and the deeper groundwater-bearing zone.

17.1.17 Site 19 Soil - Hazardous Waste Storage

- Only one soil sample (collected from boring MWD13-2) contained concentrations of SVOCs that exceeded the corresponding preliminary comparison level.

- Because of the level of toluene and the levels of SVOCs detected in boring MWD13-2, sufficient data are not available to evaluate the extent of VOCs and SVOCs in the northwest portion of the site.

- The site appears to have been impacted by petroleum hydrocarbons. Because TRPH analysis includes both the light and heavy fraction of petroleum hydrocarbons, additional soil investigation should be conducted to characterize the distribution of the light and heavy fractions of petroleum hydrocarbons in site soil.

- Sufficient soil metals data have been collected for the RI/FS evaluation.

17.1.18 Site 19 Groundwater - Hazardous Waste Storage

- Groundwater within localized areas in the vicinity of monitoring wells MWD13-1, MWD13-2, MWD13-3, and MWD13-4 may have been impacted by VOCs, SVOCS, and TRPH. Additional groundwater data will be required to evaluate the presence of these chemicals in groundwater.

- Metals are present in the groundwater at concentrations that exceed the 95 percent/95 percent statistical tolerance interval. Additional data will be required to characterize the groundwater quality and to understand the seasonal impact on the groundwater quality at this site.

- Additional groundwater monitoring well(s) in the central part of the site are required to evaluate the extent of petroleum hydrocarbons in this area of the site.

- Additional TDS data are required to evaluate whether groundwater beneath Site 19 is considered potential drinking water.

- At present, no information is available to evaluate the tidal influence on the groundwater and the deeper water-bearing zone. Additional work is required to evaluate the tidal influence on this site and the deeper water-bearing zone.

17.2 RECOMMENDATIONS

Recommendations for each of the ten Phases 1 and 2A sites are presented in the following sections.

17.2.1 General Recommendations

This section presents the recommendations that are applicable to all ten Phases 1 and 2A sites, based on the qualitative evaluation of the Canonie data. These general recommendations are as follows:

- Additional study is recommended to evaluate the impact of tidal influences on groundwater levels at all the Phases 1 and 2A sites.
- Four quarterly groundwater samplings is recommended to continue characterizing the groundwater flow direction and gradient, as well as the groundwater quality (such as TDS and chemicals of concern identified for each site).
- Cone penetrometer testing (CPT) is recommended at each site to evaluate the geology and hydrogeology of the deeper groundwater-bearing zone. HydroPunch™ groundwater samples are recommended to assist in the evaluation of the quality of groundwater in the deeper water-bearing zone.

17.2.2 Site-Specific Recommendations

This section presents recommendations that are specific to individual Phases 1 and 2A sites. These recommendations are made assuming that the Canonie data can be validated and are considered to be acceptable. For Sites 1 and 2, which were later investigated under Phases 5 and 6, the recommendations presented here are preliminary. These sites are discussed in more detail in the SWAT and DSR (PRC/Montgomery Watson, 1993c).

17.2.2.1 Site 1 Soil - 1943-1956 Disposal Area. Based on the conclusions discussed above (Section 17.1.1), the following recommendations are proposed:

- Additional surface soil samples should be analyzed to further characterize the extent of PCBs near borings DA-1, DA-2, and surface sample point G4.

17.2.2.2 Site 2 Soil - West Beach Landfill. Based on the conclusions discussed above (Section 17.1.2), the following recommendations are proposed:

- Combining these data with the data collected during the Phases 5 and 6 investigation, it is concluded that sufficient soil data have been collected to characterize the presence of SVOCs and other organics, as well as metals, in soil at Site 2. Therefore, no other recommended work is added to the recommendations discussed in the SWAT report for this site.

17.2.2.3 Site 3 Soil - Area 97, Abandoned Fuel Storage Area. Based on the conclusions discussed above (Section 17.1.3), the following recommendations are proposed:

- With the exception of TRPH, it is believed that sufficient soil data have been collected for the RI/FS evaluation at this site. No further site-wide sampling for VOCs and SVOCs in soil is needed.
- Sampling and analysis of petroleum hydrocarbons in the subsurface south of monitoring well MW97-3 should be performed.
- Additional soil investigation is recommended in the area northwest of the site to evaluate the VOCs, petroleum hydrocarbons, and metals in the subsurface.

17.2.2.4 Site 3 Groundwater - Area 97, Abandoned Fuel Storage Area. Based on the conclusions discussed above (Section 17.1.4), the following recommendations are proposed:

- Additional groundwater well(s) should be installed to evaluate the petroleum hydrocarbons in the groundwater to the west and northwest of the site. Wells installed during previous investigations should be located and their integrity determined for sampling before additional groundwater wells are installed.
- Groundwater samples should be collected on a quarterly basis for BTEX, petroleum hydrocarbon, and metals analyses.

17.2.2.5 Site 4 Soil - Building 360, Aircraft Engine Facility. Based on the conclusions discussed above (Section 17.1.5), the following recommendations are proposed:

- An additional investigation is recommended inside the building to assess whether Building 360 is a source for the VOCs in the groundwater.
- An additional soil investigation should be performed to evaluate whether the soil has been impacted by petroleum hydrocarbons.
- Because sufficient soil metal data have been collected for the RI/FS evaluation, no further sampling for metals is proposed.

17.2.2.6 Site 4 Groundwater - Building 360, Aircraft Engine Facility. Based on the conclusions discussed above (Section 17.1.6), the following recommendations are proposed:

- Additional groundwater wells should be installed to further evaluate the extent of TCE in groundwater, particularly towards the east, which is a residential neighborhood.
- Groundwater samples should be collected on a quarterly basis for VOC, SVOC, petroleum hydrocarbon, and metal analyses.

17.2.2.7 Site 7C Soil - Building 547, Service Station. Based on the conclusions discussed above (Section 17.1.7), the following recommendations are proposed:

- No additional soil analyses are recommended for VOCs in the subsurface for the RI/FS evaluation.
- Additional soil sampling should be performed to separately characterize the light and heavy fractions of petroleum hydrocarbons.
- No further investigation of metals in the subsurface is recommended.

17.2.2.8 Site 7C Groundwater - Building 547, Service Station. Based on the conclusions discussed above (Section 17.1.8), the following recommendations are proposed:

- Groundwater samples should be collected on a quarterly basis for VOC, petroleum hydrocarbon, and metal analyses.
- A downgradient well should be installed south of monitoring wells MW547-3, MW547-4, and MW547-5 to further define the extent of VOCs in groundwater at the site.

17.2.2.9 Site 9 Soil - Building 410, Paint Stripping. Based on the conclusions discussed above (Section 17.1.9), the following recommendations are proposed:

- No additional sampling and analyses of the subsurface for VOCs, SVOCs, or metals are recommended.

17.2.2.10 Site 9 Groundwater - Building 410, Paint Stripping. Based on the conclusions discussed above (Section 17.1.10), the following recommendations are proposed:

- Installation of an additional groundwater well is recommended in the vicinity of boring B410-7, where SVOCs in soil exceeded the preliminary comparison level, to evaluate whether SVOCs are present in the groundwater.

- Additional groundwater analyses for metals are recommended.
- Groundwater sampling is recommended on a quarterly basis for VOC and metal analyses.

17.2.2.11 Site 10B Soil - Building 530, Missile Rework Operations. Based on the conclusions discussed above (Section 17.1.11), the following recommendations are proposed:

- Additional soil investigation is recommended to further characterize the VOCs and SVOCs in soil near monitoring wells MW530-1 and MW530-3.
- Additional sampling of soils is recommended to characterize the petroleum hydrocarbons in the soil near well MW530-1.
- No additional soil sampling is recommended for metals evaluation.

17.2.2.12 Site 10B Groundwater - Building 530, Missile Rework Operations. Based on the conclusions discussed above (Section 17.1.12), the following recommendations are proposed:

- Installation of additional groundwater well(s) is recommended near monitoring well MW530-1 to further characterize the VOCs, SVOCs, and petroleum hydrocarbons in the groundwater.
- Groundwater sampling is recommended on a quarterly basis for VOC, SVOC, petroleum hydrocarbon, and metal analyses.

17.2.2.13 Site 13 Soil - Former Oil Refinery. Based on the conclusions discussed above (Section 17.1.13), the following recommendations are proposed:

- No further sampling and analysis of soil is recommended for SVOCs.
- Additional sampling and analyses to further evaluate the vertical extent and nature of petroleum hydrocarbons and BTEX in the soil is recommended in the vicinity of borings BOR-9, BOR-15, BOR-17, and BOR-19.
- No additional sampling and analysis for pesticides and PCBs in soil is recommended.
- No additional sampling and analysis of soil for metals is recommended.

17.2.2.14 Site 13 Groundwater - Former Oil Refinery. Based on the conclusions discussed above (Section 17.1.14), the following recommendations are proposed:

- Installation of additional groundwater wells and monitoring on a quarterly basis is recommended to collect data for evaluating the VOC, SVOC, pesticide, petroleum hydrocarbon, and metals concentrations in groundwater.

- Installation of additional groundwater wells is recommended near borings BOR-17 and BOR-19 to evaluate the levels of petroleum hydrocarbons and BTEX in groundwater beneath this area.

- Installation of additional groundwater wells is recommended along the eastern site boundary to evaluate whether the groundwater is flowing eastward into the residential neighborhood.

17.2.2.15 Site 16 Soil - CANS C-2 Area. Based on the conclusions discussed above (Section 17.1.15), the following recommendations are proposed:

- No soil samples were collected at the eastern side of the site. Therefore, additional soil sampling and analysis are recommended to characterize the surface and subsurface soil at the eastern side of the site.

- Additional soil investigation is recommended to characterize the vertical distribution of the SVOCs in the northwestern part of the site.

- No additional work is recommended for metals, pesticide, and cyanide characterizations in soil.

17.2.2.16 Site 16 Groundwater - CANS C-2 Area. Based on the conclusions discussed above (Section 17.1.16), the following recommendations are proposed:

- Groundwater sampling and analysis are recommended on a quarterly basis for VOCs, SVOCs, and metals.

17.2.2.17 Site 19 Soil - Hazardous Waste Storage. Based on the conclusions discussed above (Section 17.1.17), the following recommendations are proposed:

- Because of the high detection limits for methylene chloride and acetone in the shallow sample collected at MW13-2, additional VOC sampling at a depth of 2.5 feet bgs is recommended for this location.

- Additional soil sampling for VOCs and SVOCs in the vicinity of boring MWD13-2 is recommended.

- Sufficient data are available to evaluate the extent of metal at this site. No additional work is recommended to characterize metal in soil at this site.

- Because the TRPH analysis conducted on the samples include both the light and heavy fraction of petroleum hydrocarbons, additional soil investigation is recommended to separately characterize the light and heavy fractions of petroleum hydrocarbons in site soil.

17.2.2.18 Site 19 Groundwater - Hazardous Waste Storage. Based on the conclusions discussed above (Section 17.1.18), the following recommendations are proposed:

- Groundwater sampling is recommended on a quarterly basis to analyze for VOCs, SVOCs, petroleum hydrocarbons, and metals.
- Installation of additional groundwater monitoring well(s) is recommended in the central part of the site to evaluate the extent of petroleum hydrocarbons in this area of the site.

18.0 RESPONSE TO COMMENTS

This section presents the Navy's response to comments received from the State of California Environmental Protection Agency Department of Toxic Substances Control (DTSC) on March 4, 1993. The responses have also been incorporated in the text of this data summary report (DSR). The DTSC comments are presented verbatim in bold type. The Navy responses follow in normal type.

Additional field work is planned for all Phases 1 and 2A sites to accomplish the goals described in the recommendations section of this DSR and to address the DTSC comments found in this section. All additional work for the Phase 1 sites, the 1943-1956 Disposal Area (Site 1), and the West Beach Landfill (Site 2) will be conducted under the Phases 5 and 6 follow-on field investigations. Similarly, all additional work at Site 4 will be conducted as part of the Phases 2B and 3 follow-on field investigations (the Site 4 Plating Shop was investigated under Phases 2B and 3). Work plans for the follow-on field work for Phases 2B and 3 and Phases 5 and 6 have been prepared and submitted to the DTSC (PRC/Montgomery Watson, 1993a,b). A separate field sampling plan describing the details of the future work at the Phase 2A sites will be submitted to the DTSC.

It is important to mention that this DSR is intended to present the data collected by Canonie Environmental Services Corporation (Canonie) in 1990 as part of the remedial investigation/feasibility study (RI/FS), Phases 1 and 2A. Sites 1 and 2, which were investigated under Phase 1, were also investigated under the RI/FS Phases 5 and 6 Solid Waste Water Quality Assessment Test (SWAT) investigation conducted by PRC and Montgomery Watson in 1991. The results of the SWAT investigation have been reported in the Final SWAT and DSR for RI/FS Phases 5 and 6 (PRC/Montgomery Watson, 1993c). Although the Phases 5 and 6 data are not discussed in the Phases 1 and 2A DSR, this DSR does include the results from the Phases 5 and 6 SWAT and DSR in the conclusions and recommendations for Sites 1 and 2. All of the data collected at Sites 1 and 2 will be discussed in the comprehensive remedial investigation (RI) report.

General Comments

COMMENT #1: Data Quality Issues

Validation procedures for data collected by Canonie during the Phases 1 and 2A investigation followed the Quality Assurance Project Plan (QAPP) approved by the DTSC. The QAPP required internal data validation at the laboratory. Validation packages were prepared for two percent of the samples analyzed; however, the complete validation package was not identified as a deliverable in the Navy-Canonie contract. The data validation was, therefore, not delivered and can not be retrieved without expending major financial and human resources. The end result is external validation can not be performed.

COMMENT #1: (Continued)

Because Canonie followed the approved QAPP, the DTSC considers the Canonie data useful for site characterization and possibly risk assessment if necessary data qualifiers are available. However, in order to increase confidence in the Canonie data, verification sampling will be required. A percentage of the surface samples at Site 1 must be recollected and analyzed. See comment #13 for details on the resampling.

RESPONSE:

This comment has been addressed in the responses to agency comments on the NAS Alameda Field Sampling Plan for Follow-on Work, RI/FS Phases 5 and 6 - Landfill Investigation (Phases 5 and 6 follow-on field sampling plan). The Phases 5 and 6 follow-on field sampling plan includes collection of ten samples for semivolatile organic compound (SVOC), pesticide, polychlorinated biphenyl (PCB), total petroleum hydrocarbon (TPH)-purgeable and extractable, and total organic carbon (TOC) analyses (see response to comment #13).

COMMENT #2:

<u>Groundwater</u>

Groundwater gradients at ANAS have not been characterized enough to understand the direction of groundwater flow or the influence of tides on groundwater flow. A tidal influence study should be conducted on all sites that have not been part of a previous tidal investigation.

RESPONSE:

The recommendation for additional study to evaluate the impact of tidal influences on all the Phase 1 and 2A sites is included in Section 17.2 of the DSR. Four quarterly groundwater sampling rounds are also recommended to further characterize groundwater flow direction and gradients at the Phase 1 and 2A sites.

COMMENT #3:

<u>Site 1 and Site 2</u>

Data for these sites were also collected under Phases 5 and 6, the Solid Waste Water Quality Assessment Test (SWAT). The objective of the SWAT is to determine if contaminated groundwater is moving off site. Phases 1 and 2 are the Remedial Investigations for Sites 1 and 2. The purpose of the remedial investigations is to characterize the site, in order to design remedial alternatives and conduct risk assessments. Different sets of data have been collected for the various phases and no comprehensive report is available that condenses all the information. This makes characterization of Sites 1 and 2 difficult. In order to complete the remedial investigation, all data needs to be summarized in a single document. Data collected in Phases 5 and 6 should be summarized in the DSR. The DSR should include a short discussion of the data, data summary tables and maps. This will allow a complete assessment of the contamination at Sites 1 and 2. Condensing the information into a single document will not only aid project managers in their review, but will also provide the public with a definitive document to review.

RESPONSE:

The purpose of the Phases 1 and 2A DSR is to present the results of the Phases 1 and 2A field investigation conducted by Canonie in 1990. Because the results of the Phases 5 and 6 SWAT investigation are now available (PRC/Montgomery Watson, 1993c), they will be referenced in the conclusions and recommendations for Sites 1 and 2 in this DSR. The data presented in this DSR are also referenced by the Phases 5 and 6 SWAT and DSR. All data will be summarized in the comprehensive remedial investigation (RI) report.

Specific Comments

COMMENT #4: Sections 3.2 and 3.3

The DTSC would like to remind Navy that preliminary comparison levels shall not be used as a reference point for determining the need for further investigation or setting remediation goals at a site. The DTSC considers preliminary comparison levels as only useful for initiating discussion and for qualifying the level of contamination at a site.

RESPONSE: The Navy concurs; the preliminary comparison levels were used for a qualitative assessment of the soil data collected by Canonie. The recommendations for further investigation were based not only on the preliminary comparison levels but also on site history, general contaminant levels and distribution, evaluation of the data coverage, and sufficiency for the risk assessment as well. As stated in Section 3.2, the "levels were not generated for setting the remediation goals for NAS Alameda." Additionally, the significance of the chemicals found in soils at the Phases 1 and 2A sites will be evaluated in detail during the baseline risk assessment as part of the comprehensive RI/FS.

COMMENT #5: Section 3.2, page 3-2, first paragraph

The preliminary comparison levels identified in the following pages seem to be based on human health risks exclusively. Environmental receptors should also be considered in the comparison levels. Environmental receptors are often more sensitive and would result in lowering the preliminary comparison levels.

RESPONSE: The comparison levels used were for a preliminary evaluation of concentration. The baseline risk assessment will consider all data and take into account environmental receptors as well as human receptors.

COMMENT #6: Section 3.2, page 3-2, first bullet item

Please reference the application, by the Regional Water Quality Control Board, of 1 milligram per kilogram (mg/kg) for total Volatile Organic Chemicals (VOCs) and 10 mg/kg for total Semivolatile Organic Chemical (SVOCs) as the remediation goals in vadose zone soil for sites in the Bay Area where groundwater is considered as potable drinking water supply.

RESPONSE: These remediation goals for VOCs and SVOCs are cleanup goals established for client-confidential sites in the Bay Area with oversight by the Regional Water Quality Control Board. Therefore, the requested reference can not be included in this DSR at this time. However, remediation goals for NAS Alameda will be evaluated based on the baseline risk assessment, not on the preliminary comparison levels used for this DSR.

COMMENT #7: Section 3.2, page 3-2, third bullet item

Please reference the EPA guidance that identifies 1 mg/kg as a level that may trigger additional investigation at any site.

RESPONSE: The reference requested is the U.S. Environmental Protection Agency (U.S. EPA) "Guidance on Remedial Actions for Superfund Sites with PCB Contamination" (1990). This reference has been added to the text.

COMMENT #8: Section 4.0, page 4-1

This section should include a discussion of the validation methods described in the QAPP.

RESPONSE: A discussion of the validation methods described in the Canonie QAPP will be added to Section 4.2, Chemical Analyses.

COMMENT #9: Section 5.0, Site 1 - 1943-1956 Disposal Area

Because Navy Public Works Department employed open burning as the primary disposal method during the early 1950's, the presence of dioxin must be investigated at the extreme northwest corner of the disposal area and along the landfill's western edge.

RESPONSE: The proposed follow-on field investigation for Site 1, described in the Phases 5 and 6 follow-on field sampling plan, includes sampling for dioxin and furan in the extreme northwest corner of the disposal area, which has been identified through areal photographs as the burn area for the disposal site. No burn area was identified along the western edge of the landfill (with the exception of the northwest corner); therefore, no sampling for dioxin and furan is proposed for the western edge.

COMMENT #10: Section 5.0, Site 1 - 1943-1956 Disposal Area

This section should include a summary of data collected in the Phase 5 and 6 investigation. Conclusions on the completeness of information on the disposal area cannot be made without information from the other investigation.

RESPONSE: The purpose of the Phases 1 and 2A DSR is to present the Canonie data collected as part of the Phases 1 and 2A investigation. However, the results and conclusions from the Phases 5 and 6 investigation have been referenced in the conclusions section of this DSR regarding the completeness of data for the disposal area. The comprehensive RI report will include a compilation of all the data collected for Site 1 under the RI/FS, including the Canonie data discussed in the Phases 1 and 2A DSR.

COMMENT #11: Section 5.5.1 Site Geology/Hydrogeology

The extent of the clay member of the holocene bay mud unit underlaying 1943-1956 landfill is unknown. Geologic Cross Section A - A' in the Phases 5 and 6 SWAT Report shows the clay member of the holocene bay mud unit as non-continuous. The holocene bay mud unit, therefore, can not be characterized as a continuous aquitard. More geologic investigation is needed to better define the extent of the clay member of the holocene bay mud under Site 1.

RESPONSE: The Holocene Bay Mud unit is not discussed as a continuous aquitard in Section 5.5.1. Section 5.5.1 describes the conditions encountered in the two borings drilled by Canonie; in both borings, the Holocene Bay Mud unit was encountered below the fill and was reported as 12 feet thick. Section 5.5.1 refers the reader to the Phases 5 and 6 SWAT and DSR for a detailed discussion of geologic and hydrogeologic conditions at Site 1. Cone penetrometer tests (CPTs) have been proposed for the follow-on work at Site 1 to collect additional subsurface information to further characterize the Holocene Bay Mud at this site. Details and rationale for the locations of the proposed CPTs are presented in the Phases 5 and 6 follow-on field sampling plan.

COMMENT #12:

Section 5.5.1 Site Geology/Hydrogeology

The use of the Cone Penetrometer Test (CPT), as proposed by Navy on February 3, 1993, will add to the information on the extent of the clay member of the holocene bay mud. Two to three ground-water well clusters need to be installed east of the 1943-1956 land fill boundary defined in the Phases 5 and 6 SWAT report. This will provide information on the holocene bay mud and on the groundwater quality along the eastern margin or [of] the land fill. If we are still unable to determine whether or not communication exists between the two water-bearing zones, pumping tests may be required.

RESPONSE:

Canonie did not collect any groundwater data at Site 1; therefore there are no conclusions or recommendations regarding the groundwater. The use of CPTs, however, is proposed in the Phases 5 and 6 follow-on field sampling plan. Two groundwater well clusters are also proposed, one to the east of the landfill boundary and one to the south. Details and rationale for the locations of the proposed CPTs and well clusters are presented in the Phases 5 and 6 follow-on field sampling plan.

COMMENT #13:

Section 5.5.2 Analytical Results - Surface Soil Sampling

Because of the lack of fully validated surface samples, confirmatory sampling is required for surface soils at Site 1. Ten random samples must be collected at locations where there was no detection of semivolatile organic compounds, pesticides, PCB compounds, TRPH, and total organic carbon.

RESPONSE:

The Phases 5 and 6 follow-on field sampling plan includes a proposal for ten additional surface samples to be collected at Site 1 for chemical analyses. The proposed chemical analyses include SVOCs, pesticides and PCBs, TPH-purgeable and TPH-extractable, and general chemical analyses (including total organic carbon).

COMMENT #14:

Section 5.5.2 Analytical Results - Surface Soil Sampling

Surface soil contamination is concentrated in the triangular area west of Runway 13-13. Another 200-foot grid sampling event should occur within this area. Sampling locations should be between the points already sampled by Canonie. This would provide sampling locations every 100 feet. Conducting surface sampling in this area will augment the validated data set. Soil samples collected in or near the burn area must be analyzed for dioxins.

RESPONSE:

Based on discussions with DTSC on June 30, 1993, additional surface soil samples will be collected in the triangular area west of Runway 13-31 where elevated contaminants were indicated by the Canonie data rather than on a 200-foot grid. The analyses for samples collected in the burn area will include dioxin. The locations and rationale of the proposed samples are discussed in the Phases 5 and 6 follow-on field sampling plan.

COMMENT #15: Section 5.6 Summary and Conclusions

Prior to concluding that sufficient soil data have been collected the Navy must determine that adequate data is available for completing the human health and environmental risk assessments and for future remedial design.

RESPONSE: Section 5.6, Summary and Conclusions, will be revised to include reference to conclusions made in the Phases 5 and 6 SWAT and DSR so that all data can be taken into account in assessing the sufficiency of the data for completing the human health and environmental risk assessments and for future remedial design.

COMMENT #16: Section 5.6 Summary and Conclusions

The groundwater under the site has not been fully characterized. More wells which are screened in the second water bearing zones are required. Two to three well clusters are needed along the eastern and southern boundaries of the disposal cells as shown in Figures 8-2 and 8-4 of the Phases 5 and 6 SWAT Report.

RESPONSE: Canonie did not collect any groundwater data at Site 1; therefore, there are no conclusions or recommendations regarding the groundwater. However, the Phases 5 and 6 investigation included groundwater sampling and analysis; the results of that investigation are presented in the Phases 5 and 6 SWAT and DSR. Well clusters are proposed for Site 1 along the southern and southeastern boundaries of the disposal cells and are addressed in the Phases 5 and 6 follow-on field sampling plan.

COMMENT #17: Section 6.0 Site 2 - West Beach Landfill

Very little sampling was conducted in this phase of analysis at Site 2. This section should also include a summary of data collected in the Phases 5 and 6 investigation. Conclusion on the completeness of information on the disposal area cannot be made without information from the other investigation.

RESPONSE: The purpose of the Phases 1 and 2A DSR is to present the Canonie data collected as part of Phases 1 and 2A. However, the results and conclusions from the Phases 5 and 6 investigation have been referenced in the conclusions section of this DSR regarding the completeness of data for Site 2. The comprehensive RI report will include a compilation of all the data collected for Site 2 under the RI/FS, including the Canonie data discussed in the Phases 1 and 2A DSR.

COMMENT #18: Section 6.5.1 Site Geology/Hydrogeology

More data is needed on the occurrence of the clay member of the holocene bay mud in the south west portion of Site 2.

RESPONSE: The characterization of the Holocene Bay Mud unit beneath Site 2 has been revised to reflect the conclusions presented in the Phases 5 and 6 SWAT and DSR. CPTs have been proposed for the follow-on work at Site 2 to collect additional subsurface information. Details and rationale for the locations of the proposed CPTs are presented in the Phases 5 and 6 follow-on field sampling plan.

COMMENT #19: Section 6.6 Summary and Conclusions

Please support the statement that the PAHs detected in the surface sample at WB-3 may be natural in origin.

RESPONSE: At present there is no history of PAH disposal in the landfill near WP-3, and thus the PAHs detected in the sample likely did not originate in the landfill. A statement has been included in Section 6.6 that explains the PAHs detected are suspected of originating in the fill before it was brought to the landfill site, possibly as a result of the oil refinery operations near portions of the San Francisco Bay that were dredged to provide material for the landfill.

COMMENT #20: Section 6.6 Summary and Conclusions

Conclusions should also be made on the completeness of groundwater data collected at Site 2. More information is needed on the quality of the second water bearing zone along the southern margin of the West Beach Landfill.

RESPONSE: The purpose of the Phases 1 and 2A DSR is to present the Canonie data collected as part of Phases 1 and 2A. Canonie did not collect any groundwater data at Site 2; therefore, there are no conclusions or recommendations regarding the groundwater. The proposed follow-on field investigation at Site 2 is addressed in the Phases 5 and 6 follow-on field sampling plan and includes CPT and HydroPunch® to further evaluate the quality of groundwater in the second water-bearing zone along the southern margin of the West Beach Landfill.

COMMENT #21: Section 7.0 Site 3 - Area 97, Abandoned Fuel Storage Area

Both the Kennedy Engineers and the Wahler Associates investigations found contamination associated with the storm sewers and sanitary sewers. A comparison of the soil gas survey with the storm sewers shows a possible relationship between the two. The storm sewers and the fill material surrounding the storm sewers should be investigated as a possible conduit of contamination.

RESPONSE: The DSR reports that none of the Canonie soil samples were collected from areas of elevated soil gas concentrations and recommends additional sampling in those areas. Recommendations for additional soil samples near sample locations with high concentrations of hydrocarbons from the Kennedy Engineers (Kennedy) and Wahler Associates (Wahler) investigations and the 1985 trench have been included in sections 7.0 and 17.0 of this DSR. The locations of proposed soil borings and groundwater monitoring wells will be addressed in the work plan for the follow-on field investigation at the Phase 2A sites. The storm sewers as a possible conduit of contamination will be investigated. The details of the sampling program will be addressed as part of the follow-on field investigation at the Phase 2A sites.

COMMENT #22: Section 7.5.2 Summary and Conclusion - Soils

Because none of Canonie's soil samples were collected from areas where elevated soil gas levels were found, Navy cannot conclude that with the exception of TRPH, sufficient soil data have been collected for the RI/FS evaluation.

RESPONSE: Section 7.5.2 has been revised to clarify that the Navy concludes that sufficient soil data have been collected to the northeast of the site. The Navy recognizes that additional soil work will be required to evaluate TRPH and BTEX in areas where elevated soil gas levels were found (the northwestern part of the site; see Section 7.5.2, second bulleted item).

COMMENT #23:

Section 7.5.2 Summary and Conclusion - Groundwater

The groundwater wells evaluated in the Canonie investigation have no relationship with the plume identified by soil gas survey. Therefore, conclusions can not be made as to the presence of VOCs, SVOCs, and EDBs. Additional groundwater wells are necessary to evaluate VOCs, SVOCs, EDBs, and TPH in the groundwater to the west and northwest.

RESPONSE:

In both the Kennedy and Wahler investigations, the concentrations of gasoline hydrocarbons (AVGAS in the case of the Kennedy investigation) were low (a maximum of 41 mg/L at OW-23 located on the west side of Area 97 [Kennedy, 1980]). No gasoline hydrocarbons, VOCs, ethylene dibromide (EDB), or SVOCs were detected in the groundwater from Canonie well MW97-3, which is located within Area 97. Recommendations have been made to monitor hydrocarbons, VOCs, and BTEX in groundwater at the site on a quarterly basis. EDB will be included in the recommended analyses. However, because no SVOCs were detected in the groundwater and there is no history of SVOCs used at the site, the quarterly groundwater samples will not be analyzed for SVOCs.

COMMENT #24:

Section 7.5.2 Summary and Conclusion - Groundwater

Wells installed during previous investigations should be located and their integrity determined. Wells that may be useful to this investigation are: OW-1, OW-2, OW-3, OW-6, OW-14, OW-16, OW-23, OW-25, WA-7, WA-8, and WA-9.

RESPONSE:

The Navy agrees that previously installed wells should be sampled provided they are of acceptable integrity; the recommendations will be revised to reflect this. Details of the task will be discussed in the work plan for the follow-on field investigation at the Phase 2A sites; however, the success of this endeavor may be limited. Sampling the existing Kennedy wells was part of the Wahler investigation in 1985. Thirteen of the eighteen Kennedy wells were found, one of which was later covered with an asphalt patch during street repairs (Wahler, 1985). The three wells located within Area 97, OW-1, OW-23, and OW-25, were among those wells not found. Wahler also reported that many of the Kennedy wells appeared to contain large quantities of soil, which prevented clear access to the entire original screened interval. Some well caps were, at that time, located at or below grade, which may have allowed material to enter the well casings. As part of the Phases 2B and 3 investigation at Sites 7B and 11, an attempt was made by the PRC team to locate several of the existing wells. Well WA-8 was located; however, wells OW-2 and OW-21 could not be located. During the next phase of field work, the integrity of the wells identified by the DTSC will be evaluated; wells that produce representative groundwater data for this site will be included in the groundwater monitoring program.

COMMENT #25: Section 8.5.2 Groundwater, page 8-9, last paragraph

Please elaborate on what is meant by the statement; "12 of these metals have an extreme upper concentration that can be found in typical groundwater samples; with the exception of vanadium, the concentrations at Site 4 are within those extreme upper limits."

RESPONSE: The referenced statement will be clarified as follows: "Based on Table 3-4, which presents both a typical range and extreme value of natural concentrations of various elements in groundwater, 12 of the metals detected in the groundwater have an extreme upper value for natural concentrations found in groundwater. The concentrations of metals detected in the groundwater at Site 4 are less than natural extreme upper values with the exception of vanadium, which was detected at a concentration above the extreme upper value typical for vanadium in groundwater."

COMMENT #26: Section 9.1 Site Description and Background

Two waste oil tanks are thought to be located at Site 7C, the Service Station; however, their exact location is unknown. These tanks should be located and a determination made as to if they are sources of contamination.

RESPONSE: A visit to Site 7C was made to determine if any visible evidence existed to locate the waste oil tanks; none was found. During the preparation of the Phase 2A follow-on field sampling plan, discussions with base personnel will be made in an attempt to locate the two waste oil tanks. If the tanks are found, the text and maps will be incorporated into the Phase 2A follow-on field sampling plan.

COMMENT #27: Section 10.5.1 Summary and Conclusions - Soils

Methylene chloride and acetone were detected in all soil borings. Toluene was also a prevalent contaminant. The distribution of VOCs may indicate wide-spread, low level contamination at Site 9. The Department does not agree that sufficient VOC data have been collected for the RI/FS evaluation. The source of the contamination is unknown and because [of] the distribution of sampling points, VOC levels at other areas of Site 9 are unknown. The Navy should conduct a soil gas survey in order to identify high levels of VOCs. Soil sampling may be necessary after the soil gas survey in order to better characterize the extent of VOC contamination at Site 9.

RESPONSE: Methylene chloride and acetone were detected at several other sites and are suspected to be laboratory artifacts. The levels of these VOCs detected at Site 9 are low. Toluene was also detected at low concentrations except at boring B410-7. Boring B410-7 is located in the northeast portion of the site and has two borings within 150 feet to the southeast and southwest and two borings within 200 feet to the north. These four borings had comparatively low concentrations of toluene (< 0.1 mg/kg); four other borings at the site also had concentrations below 0.1 mg/kg. The results from a soil gas survey are not expected to reveal much information due to the low concentrations of VOCs in the soil. There appears to be no history of VOC use outside the building.

RESPONSE: (Continued)

Operations inside the building, however, consisted mainly of paint stripping; the Initial Assessment Study (E&E, 1983) indicates that paint strippers used contained methylene chloride, among other chemicals. During the preparation of the Phase 2A follow-on field sampling plan, the site history will be further investigated in an attempt to identify potential sources for toluene and VOCs. If potential VOC sources are identified, additional soil sampling will be proposed in the Phase 2A follow-on field sampling plan.

COMMENT #28:

Section 12.5.1 Summary and Conclusions - Soils

The highest level of contamination at Site 13 is found at BOR-9. Further soil sampling is required near the vicinity of BOR-9 in order to better characterize the extent of contamination and possibly identify a source area.

RESPONSE:

Section 17.0 recommends additional soil sampling near borings BOR-9, BOR-15, BOR-17, and BOR-19 for petroleum hydrocarbons. These recommendations have been revised to include sampling for BTEX. The locations proposed for additional soil sampling will be presented in the Phases 2A follow-on field sampling plan.

COMMENT #29:

Section 12.5.1 Summary and Conclusions - Groundwater

An additional groundwater well is necessary east of BOR-9 in order to further characterize groundwater contamination near that boring.

RESPONSE:

Monitoring well MWOR-3 is located approximately 320 feet to the east of BOR-9. Furthermore, only 17 μg/L of methylene chloride was detected in groundwater from MWOR-3. For these reasons an additional well in that location is not recommended.

COMMENT #30:

Section 14.4.2.1 Volatile Organic Compounds

Detection limits for methylene chloride and acetone were 1400μg/kg for soil sample MWD13-2. Because of the high detection limit this area should be resampled and reanalyzed with lower detection limits.

RESPONSE:

The high detection limits for methylene chloride and acetone at a depth of 1.5 to 2 feet below ground surface (bgs) at MWD13-2 are due to the high concentrations of other VOCs (toluene, xylenes, and 1,3-dichlorobenzene) in the sample. The recommendations have been revised to include a sample collected from a depth of 2.5 feet bgs adjacent to MWD13-2 for VOC analysis.

COMMENT #31:

Section 14.5.1 Summary and Conclusions - Soils

Because of the high detection limit for methylene chloride and acetone, the concentration of toluene, and the levels of SVOCs, more soil sampling is required near boring MWD13-2.

RESPONSE

Section 17.2.2 recommends additional soil sampling at Site 19 for petroleum hydrocarbons; additional analysis for VOC and SVOCs will be added to the recommendations. The locations proposed for the additional soil sampling will be presented in the Phase 2A follow-on field sampling plan.

COMMENT #32: Section 16.1.1 Human Receptors

Please explain why near by residents were not considered human receptors when residential neighborhoods are adjacent to the eastern boundary of the base.

RESPONSE: The human receptors are considered as a single group consisting of workers and visitors to the base because these on-base individuals comprise the main portion of potential human receptors. Special off-base receptor groups and exposure scenarios will be identified and fully discussed in the risk assessment.

COMMENT #33: Section 16.1.1 Terrestrial Organisms

Is the wetland habitat at Site 2 considered a terrestrial or marine habitat?

RESPONSE: The exposure pathways table in Section 16.1.1 shows both terrestrial and marine pathways completed for Site 2. For the baseline risk assessment, the wetland habitat at Site 2 will be evaluated based on the results of the Ecological Assessment currently being conducted by PRC and Kinnetics Laboratories, Inc.

FINAL DATA SUMMARY REPORT
REMEDIAL INVESTIGATION/FEASIBILITY STUDY
PHASES 1 AND 2A

DATED 25 AUGUST 1993

THIS RECORD CONTAINS MULTIPLE VOLUMES
WHICH HAVE BEEN ENTERED SEPARATELY

VOLUME II OF II IS ENTERED IN THE DATABASE
AND FILED AT ADMINISTRATIVE RECORD NO.
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